ENGINEERING NEWS-RECORD

CEMBER 31, 1942

CONCRETE SHIPS

ricated forms in units weighing ch as 12½ tons featured con- on at a Pacific Coast yard that ed the war's first concrete ship.

ALCAN HIGHWAY

y problems, equipment main- ce and living conditions on ica's Glory Road.

"BIG INCH" PIPELINE

n-the-scene story of record- ing performance in building rld's longest oil pipeline.

OIL-CEMENT PAVING

e Yankee ingenuity trans- d a desert waste into a land- field for our biggest bombers.

TRACT RENEGOTIATION

new facts that will aid con- rs engaged in war work.

☆

g into plywood form for exterior the war's first concrete ship.

In the war against the Axis, many new weapons have been developed that cannot be described in detail now. But in the war with that eternal enemy, corrosion, both the Armed forces and the Maritime Commission make extensive use of an old and non-secret weapon . . . genuine wrought iron. In these landing boats built by Chris-Craft, keel strips, protection strips and cushioning rails are Byers Wrought Iron.

Such current wartime use is a continuation of long-time engineering practice, which has applied wrought iron in dozens of different services where severe corrosion was encountered. Hull plates in tugs and barges, deck plates in dredges, deck flushing, water, steam, vent and fire lines in cargo ships, stacks, refrigeration piping, bunkers, and engine exhausts . . . the list is far too long to itemize. But each application is based on successful past experience . . . and each provides a dependable guide for specifiers and purchasers who are looking for a time-proven durable material today.

If you have any application, in vessels or in water-front structures, where severe corrosion from salt water, sea air, or polluted river waters causes premature failure of ordinary materials, why not find out from us what wrought iron has done in similar situations? Our Engineering Service Department will be glad to check through our "Experience Pool" and give you the results.

If you have any questions as to availability or delivery, we urge that you get in touch with one of our Field Service Representatives, the nearest District Office, or the home office in Pittsburgh. You can thus be sure of an authoritative answer, rather than depending on hearsay or rumor.

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Vol. 129 DECEMBER 31, 1942 No. 27

COMING NEXT

• A 32-page special section devoted to the problems highway engineers are experiencing in maintaining their roads under heavy wartime traffic with such materials and equipment that are available under war restrictions. Thomas H. McDonald in the leading article will discuss the material aspects of these problems. Construction of the Detroit Expressway is covered in detail, and the last article in the Alcan Highway series—construction and engineering problems—are also included.

• To save steel for front line implements of war, the designers of the Nation's largest war plant adopted a concrete frame and multiple-arch thin-slab concrete roof for the project. The adopted design required only 2.7 lb. of steel per sq.ft. of floor area, whereas the original design in steel called for 12.7 lbs. This interesting design will appear in *ENR* for Jan. 14.

• Locating of a 20,000-man Army camp on a flat site, where the only waterway for sewage disposal is a small stream, called for treatment works affording a high degree of purification with small loss-of-head. The plant designed to meet this need employs the bio-filtration process, the head loss from influent to outflow channels being only 10.31 ft.

LOOKING AHEAD

• In a single 12-month period the California Shipbuilding Corporation delivered 67 EC-2 class vessels from only 14 ways—an accomplishment exceeded only by the bigness of the plans and unprecedented steel fabricating procedure that made this record possible. The many problems incident to getting this yard underway (one of the first wartime yards to be laid out), and to provide for extensive pre-fabrication will be covered in an early issue.

• From Florida to California and from Maine to Montana, a small army of engineers' and contractors' crews have been in the field since last May doing substantially the same thing in a dozen or more different ways. They are building the Flight Strips—auxiliary landing areas for aircraft—that comprise this $10,000,000 program. How this vast program is being carried out is the subject of a forthcoming article.

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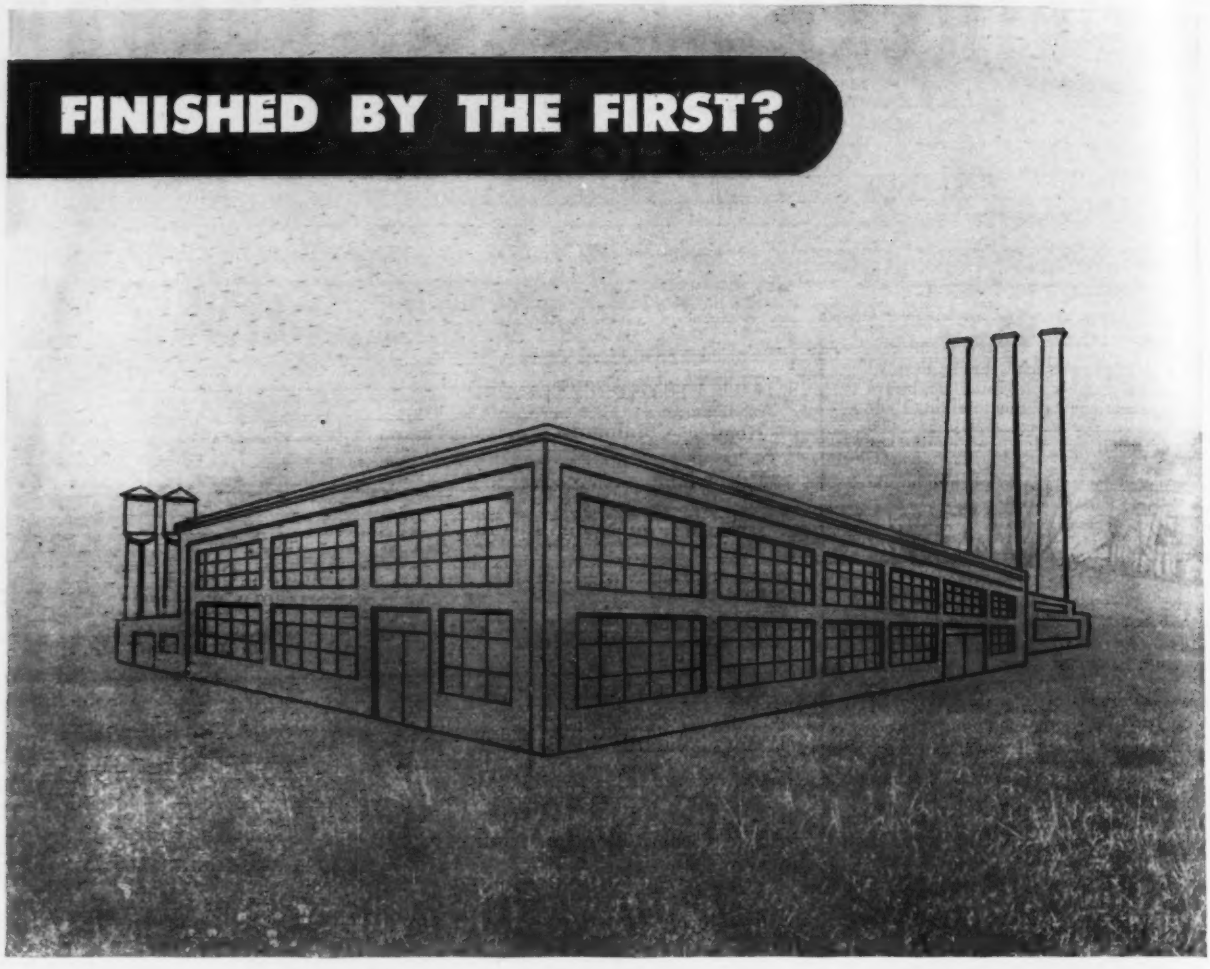

Preview of war plant which must be built in a rush. How time can be saved by building it with Atlas High-Early cement

AN empty lot today—and after not too many tomorrows it will be another unit on the war production front. And in keeping vital war construction on the double-quick, Atlas igh-Early cement has proved that it has an essential part to play. Why?

Because Atlas High-Early cement speeds completion of concrete work in these three distinct ways:

1. Concrete may be used sooner because Atlas High-Early cement gains strength rapidly — produces usable concrete quickly. n some jobs contractors have reported that they have put the concrete in service in one day, whereas it would have been necessary to wait three to five days with standard portland cement. Thus men and machines are released for new work more quickly.
2. Time for protection and curing is cut to the bone... cut as much as 70%. This feature is particularly important in cold weather construction.
3. Forms may be stripped more quickly, often in 24 hours instead of three to five days. Thus fewer forms may be necessary—saving time, labor and lumber.

Many architects, engineers and contractors, faced with a rush construction job, have found that Atlas High-Early cement can be relied upon for quick war production—construction of factories, military highways, airport runways, floors or foundations.

Whatever your job may be, consider Atlas High-Early cement. It will help you save time, cut costs, and finish work faster. Universal Atlas Cement Company (United States Steel Corporation Subsidiary), Chrysler Building, New York City.

* * *

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ENR-11-50

The Week In Engineering and Construction

ENGINEERING NEWS-RECORD • DECEMBER 31, 1942 • VOLUME 129 • NUMBER 27

Generally higher prices seen as a result of OPA chief shift

Effect of Henderson resignation on construction regulation 251 is uncertain, but allowable labor cost might be expected to increase according to capital view

Construction men shouldn't tear up their copy of Price Regulation 251 (*ENR*, Nov. 5, p. 613), but they should recognize that the resignation of Leon Henderson as price administrator, and his replacement by Prentiss Brown points to generally higher prices in the coming year.

General expectation in Washington is that farm prices will soon be allowed to rise substantially. The attendant increase in the price of food will, it is believed, make it impossible to hold with any firmness to the stabilization of wages at Sept. 15 levels that was attempted last October. It may be necessary to modify the stabilization program itself, or, at the very least, so many wage increases will have to be imposed as markedly to affect the wage level.

With wages rising, it will be impossible to hold the line on price ceilings anywhere, though increases will come more slowly than on farm goods.

Another effect of the new regime is likely to be a much more receptive attitude by OPA to requests from businessmen for changes and relaxations in price orders. Also, it is now more unlikely that OPA will make use of such drastic enforcement provisions as its power to revoke licenses. Many construction men have been disturbed by the inclusion in Regulation 251—the construction price order—of a provision granting a revocable license to everyone engaged in construction. Not all of those who were worried realized that this licensing clause has been a standard feature of all OPA regulations since the power to enforce price ceilings by revocation of licenses was granted to OPA by the Price Control Act of 1942. Any such revocation, under the law, is reviewable by the courts, and so far OPA has never revoked a license.

Minor changes in Regulation 251, which have been in preparation for some weeks (*ENR*, Nov. 26, p. 737) are now expected to be issued in January, though the confused administrative situation resulting from the change in administrative chiefs makes predictions hazardous. The most important of the changes is expected to simplify the procedure for revising ceilings in order to reflect wage increases approved by the War Labor Board or the Labor Department's Wage Adjustment Board. Other changes will be purely technical, as changing the times for filing certain reports and the like.

Washington opinion would not interpret a mere change of OPA administrators as such a portent of higher prices were it not for the fact that the Henderson-Brown switch was clearly a concession by the President to Congressional and public opposition to price control itself—a concession which cannot but be followed by more concessions.

It was the farm bloc, specifically, that pulled Henderson down, and the farm bloc will be stronger in the next Congress. Moreover, it has the support of congressmen speaking for other elements in the community. Thus, less price control can be expected in 1943.

. . .

Army construction work totals $10,000,000,000

The U. S. Army has carried out an army construction program valued at about $10,000,000,000, Lieut. Gen. Brehon B. Somervell, Commanding General, Services of Supply, said in a recent radio address.

General Somervell was a speaker in one of a series of radio programs entitled "Construction Goes to War," sponsored by the Associated General Contractors of America, Inc.

"The accomplishments of the construction industry are of fundamental importance to the Services of Supply," General Somervell said. "The construction industry went to war more than two years ago. Today we look on it virtually as a branch of the armed services.

"The army officers supervising our $10,000,000,000 program, the contractors, architects, engineers and workmen have done a magnificent job.

Photo by British Combine

Rebuild water line after Africa fighting

Troops of the British Eighth Army have just captured El Daba after fierce fighting with the rear guard of the German Afrika Corps, the Royal Engineers move into the van to repair a vital water-supply pipe ripped up by the fleeing enemy to slow the British advance.

As shown, the work is being done entirely by hand, the pipe leading from an oasis some miles away over the flat desert plain to the newly-occupied settlement.

Purcell named head of California works bureau

Charles H. Purcell, chief engineer of the San Francisco-Oakland Bay Bridge and California state highway engineer, has been named state director of public works by Governor-Elect Earl Warren.

Purcell will succeed Frank W. Clark, who has held the post for the past four years.

Born in Nebraska, Mr. Purcell attended Stanford University, and did design work for a Nevada mining company; was principal assistant chief engineer for the Cerro de Pasco company, a railroad and mining organization, in Peru; served as the first bridge engineer for the Oregon State Highway Department and was bridge engineer on the Columbia River Highway.

He left the Columbia River organization to become district engineer for the U. S. Bureau of Public Roads for a district comprising five northwestern states and Alaska, and became State Highway Engineer in 1927 for California.

• • •

Wyoming highway bureau superintendent resigns

The resignation of Frank Kelso, Wyoming Highway superintendent for the past four years, was announced Dec. 16 by G. F. Schoonmaker, chairman of the State Highway Commission. The resignation becomes effective January 18, 1943.

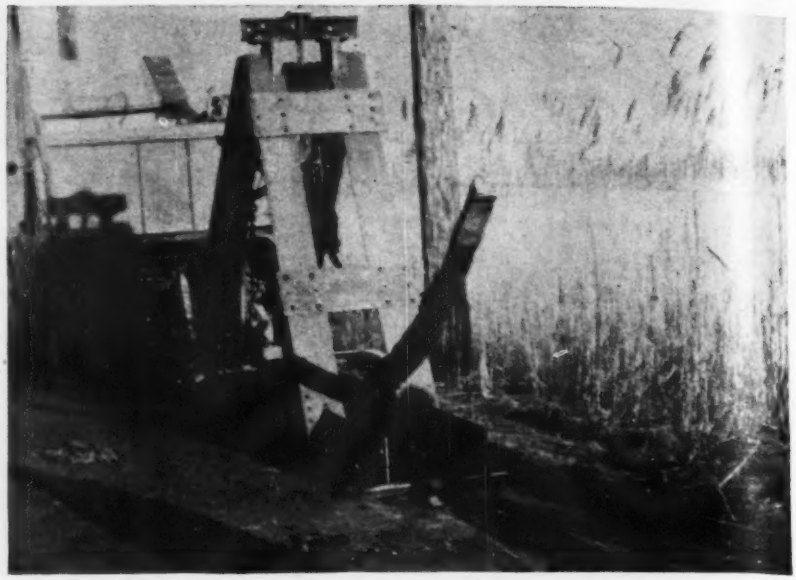
The commission chairman said Mr. Kelso had not announced what his future plans were, and that no successor had as yet been named.

Mr. Kelso, who as superintendent headed the state's largest department, was appointed to his post in 1939, succeeding C. F. Seifried of Cheyenne, who became chief highway engineer at that time. Before taking over the highway post, he had been superintendent of Wyoming operations for the Inland Construction Co., of Omaha, Neb., at the company's office in Lander, Wyo.

• • •

Geological Survey's 1942 work vital to war

Data of vital military importance on developed water power in North Africa, and specific information on terrain, water supplies, building materials and other elements essential to military occupancy were made available to the War Department by the U. S. Geological Survey during 1942, according to an annual report submitted last week to Secretary of the Interior Ickes.



Simple lifter removes rails without digging

Spurred by a contract to recover 1,000,000 ft. of rail from beneath paved streets to add to the nation's steel scrap pile, contractors developed a simple device that has pulled up as much as 2000 lin.-ft. in an hour.

The device, consists of a pair of skids, made from halves of an I-beam, cut down the center of the web and spaced far enough apart to permit the rail to be pulled up between the halves. A heavy steel roller is placed between the skids to ride under the rail and skim it out of the pavement. An A-frame provides support for a block and fall needed initially to pull the rail above the roller, and also stiffens the I-beam skids.

A hole is dug under the end of the rail and a line through the block and fall pulled ahead by a truck to raise the rail from the ground. The roller is slipped under the rail into prepared holes in the beams and the line slacked to let the rail down on the roller. The truck is then connected to the front of the skids with a low hitch, and operated at low-low speed to pull the rail lifter forward.

As the device slides ahead over the rail, the bottoms of the skids confine the hole opened to a fairly straight line. Rail is lifted readily through asphaltic road topping. The salvaged rail is cut by oxyacetylene torch into convenient lengths. When there is concrete on both sides of the rail it is not necessary to cut the concrete from more than one side and under some conditions the lifter is said to work satisfactorily without any advance cutting of pavement.

The lifter was developed by Fred W. Stiefel, formerly chief engineer Samuel R. Rosoff, Ltd., and is now being used on work in New Jersey by Ward Bros. Inc. Permission for contractors to use the invention may be secured through Fred W. Stiefel Associates, 60 E. 42nd St., New York, N. Y., on a royalty basis.

Uphold New York officials on city planning jobs

Robert Moses, New York City Commissioner of Parks, and Irving V. A. Huie, Commissioner of Public Works, are within their rights under the city's charter in holding unsalaried positions as members of the City Planning Commission, under a recent ruling of the state's appellate court.

Validity of holding "dual jobs" by the two officials had been challenged by a citizens' organization.

The court held that there was no incompatibility in the duties of the commissioners and the duties of members of the planning body, and that the charter expressly authorizes the appointment of the commissioners to unsalaried memberships in the planning commission.

WPB division issues road equipment guide

What forms are to be used and what procedures are to be followed by governmental divisions—federal, state and local—in applying to WPB for permission to purchase roadbuilding equipment, are outlined in Pamphlet No. 1 of the WPB's Governmental Division. This is the first of a series of reports to be published by the division to let "all interested public officials know where they stand."

After first pointing out that 90 percent of all new construction machinery must go to the armed forces, and that officials must in general get along with the used equipment already in their hands, the pamphlet outlines how equipment and parts may be applied for under Limitation Orders L-53 and L-192.

Washington highlights at year's end

As the war year 1942 ended with Congress in adjournment, Washington's vast governmental organization took no respite. Reflecting part of the great task of gearing all industry to the war effort were these moves:

CONSTRUCTION wage increases approved unanimously by the Labor Department's Wage Adjustment Board will be given immediate, automatic approval by the War Labor Board, which, under the stabilization order of last October, must approve all wage increases above Sept. 15 levels. Construction wages on government work have been frozen since last July except as increases are approved by the Wage Adjustment Board. Non-unanimous decisions will be given automatic WLB approval after seven days unless an appeal is taken to WLB by the dissenting board members, in which case WLB will consider the case on its merits.

TRAINING of engineering students at government expense to meet the needs of civil industry will, when details are announced, prove to be a bigger program than the Army-Navy training schemes already set up (*ENR*, Dec. 24, p. 877). The military program is expected to involve about 200,000 students at some 200 schools.

CONSTRUCTION work that is part of the necessary production operations of the logging industry has been removed from the provisions of Conservation Order L-41, which regulates most types of civilian construction. Supplementary Order L-41-c, issued recently, provides that L-41 shall not apply to "operational construction" by any logger. The term is defined to mean any construction directly related to changing the site of logging operations or the tapping of new stumpage. Removal of camps or the combining of two or more such camps as part of logging operations are examples of "operational construction." Other permissible construction includes the moving of railway track and the building of rail extensions; the building of main truck routes and access roads; and construction of branch and stump roads and the like.

NATIONAL emergency specifications for the design of reinforced concrete buildings will become effective Jan. 1, 1942. The date was set in an amendment to a directive issued October 5, placing the deadline for compliance on December 5. However, there was a delay in printing the specifications in a booklet, and it has become available only recently in sufficient quantities for general distribution.

A NEWLY DEVELOPED grade of Douglas Fir plywood, known as Hutment, designed to be used as a substitute for other exterior types of plywood in temporary military housing, may become an important factor in war production under the provisions of Limitation Order L-150-b. Adoption of a special plywood for temporary military housing was recommended to WPB by the Softwood Plywood Industry Advisory Committee several weeks ago. Hutment grade plywood will be manufactured in accordance with specifications contained in the order and will be saleable for the single purpose of temporary military housing.

A DECLINE of 30 percent was shown in November building permit valuations as compared with October, Secretary of Labor Frances Perkins reported recently "All types of building construction shared in the decrease," the secretary said, "but the most pronounced drop was in the value of new nonresidential buildings, which decreased 52 percent. New residential valuations declined 21 percent, and those for additions, alterations and repairs to existing structures declined 25 percent. November building permit valuations were 66 percent lower than during the corresponding month in 1941. The decline for new residential buildings amounted to 52 percent, for new nonresidential buildings, 85 percent; for additions, alterations and repairs, 46 percent."

EFFORTS of the War Production Board to conserve the use of steel for more critical war purposes have shown their effect in the monthly booking reports of fabricated structural steel received by the American Institute of Steel Construction. New business booked during November amounted to but 45,972 tons, the lowest on record since the termination of World War 1. Current operations, however, based upon orders previously booked, hold up fairly well, the backlog of the industry being 566,581 tons on December 1. New orders booked during November were but little over one-third of the volume booked during the same month of 1941. Shipments of fabricated structural steel during November were but little over one-third of the volume booked during the same month of 1941. Shipments of fabricated structural steel during November amounted to 127,052 tons, a decline of 30 percent from the volume during the same month in 1941.

INSTALLATIONS of rigid electrical conduit and electrical metallic tubing, flexible metal conduit and tubing, and metal raceways for enclosure of wire and cable, will be much curtailed in 1943 under provisions of a new limitation order (L-225) issued by the War Production Board.

AWARD of MERIT

CONSTRUCTION BATTALIONS, U. S. NAVY

THIS CERTIFICATE IS AWARDED TO Waldo G. Bowman
IN ACKNOWLEDGMENT OF HIS PATRIOTIC CONTRIBUTION TO THE WAR EFFORT IN OBTAINING THE ENLISTMENT OF RECRUITS FOR SERVICE IN THE CONSTRUCTION BATTALIONS OF THE UNITED STATES NAVY

Ben Moreell

BEN MOREELL
Rear Admiral, Civil Engineer Corps, U. S. Navy
Chief of the Bureau of Yards and Docks
Navy Department, Washington, D. C.

ISSUED December 1, 1942

News-Record editor gets Navy award for Seabee story

Engineering News-Record is proud to be one of the first recipients of the Navy's new "Award of Merit", presented to Waldo G. Bowman, editor, for "obtaining the enlistment of recruits for service in the Construction Battalions of the United States Navy."

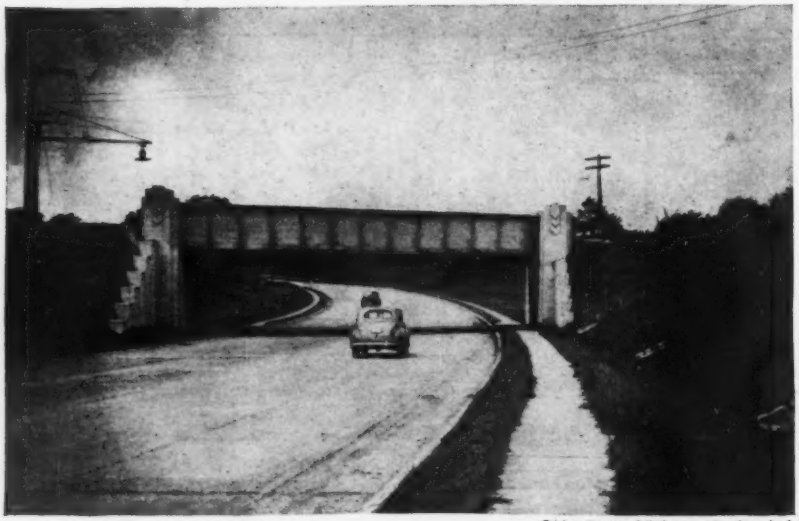
The award, signed by Rear Admiral Ben Moreell (CEC) USN, Chief of the Bureau of Yards and Docks, was given for the story "The Seabees are Coming", which was published in the issue of Sept. 24, 1942. Nearly 15,000 reprints of the article have been distributed.

A Canadian city builds housing project

Construction of five multiple brick houses for the city of St. John, N.B., is going ahead rapidly, despite rigorous winter weather. When completed, these buildings will provide accommodations for 54 families.

St. John is reported to be the first Canadian municipality to build homes without a government loan. The five houses will form the nucleus of a development which has been named Rockwood Court, near the entrance to Rockwood Park, a public recreational property east of the city. Plans call for eventual erection of homes for about 125 families at Rockwood Court and at two other sites.

The contract for excavating, grading and filling was executed by the Maritime Construction Co., Fairville, N.B., and that for the buildings is undertaken by the Mooney Construction Co. of St. John. Houses have a concrete foundation, hollow tile walls, hardwood floors, Douglas fir trimmings, painted walls and ceilings.



Ohio State Highway dept. photo

Ohio eliminates railroad grade crossing

Recently completed by the Ohio department of highways is the elimination of a grade crossing of a railroad and state route 261 in the city of Kent. The old road had four right-angle turns, one of which was immediately on the crossing, and contained a very narrow creek bridge within a 1500-ft. stretch.

The new project substitutes one gradual curve for the four turns, and materially shortens the distance traveled.

The crossing structure itself is a 60 ft. normal span of double track structural steel through girder design. Floor depth had to be kept to a minimum, so the concrete floor slab on stringers is depressed between floor beams to provide pockets for a ballasted track design. Due to skew of crossing and curvature, one girder is 72 ft., 3 in., and the other 73 ft., 1 in. long, center to center of supports. Abutments are of reinforced concrete design.

Contractor for the improvement was the National Construction Co. of Cleveland, Ohio.

NHA approves huge new war-worker housing jobs

Immediate construction of another 5,040 dormitory accommodations for migrant war workers in the Portland, Ore.-Vancouver, Wash., area; and of 4,600 additional accommodations in the Norfolk-Portsmouth, Va., area, has been authorized by the National Housing Agency.

In announcing the new projects, John B. Blandford, NHA administrator, said that allocation of such a huge program in the Pacific Northwest was necessitated by rapidly expanding war industries there. He added that in the Norfolk-Portsmouth area, civilian population has jumped by more than 80,000 workers in a two-year period.

He said the new units at Portland will be barrack-type structures, designed to serve primarily as a reception center and temporary quarters for incoming male workers. In Virginia, the project will include construction of 1,500 family dwelling units, 2,350 dormitory apartments and 750 dormitory rooms.

Announcement of the two new projects spotlighted the tremendous scope of public housing work already completed or under way in the two areas. In the Portland-Vancouver area the program is so large that the 35 projects on both sides of the Columbia River constitute almost separate communities. The Vanport project just north of Portland will house 40,000 persons and be Oregon's second city.

Priorities for home-conversion

Meanwhile, in another move to alleviate the housing shortage in the face of continuing material scarcities, NHA announced that privately-financed conversion of houses and other buildings to create additional accommodations for war workers will be given the same high priority ratings as those given for publicly-financed conversion projects.

Privately-financed projects will receive AA-4 ratings—highest granted for housing construction of any type. This rating is said to be sufficient to obtain all building materials from the stocks already allocated to housing under the recent NHA-WPB agreement (*ENR* Dec. 24, p. 883).

It will take a few weeks for WPB to get the necessary regulations and forms to the field. Only restriction placed on private conversion projects is that they must be limited to critical areas programmed by NHA, and all accommodations produced must be rented to eligible war workers.

BARRETT & HILP, San Francisco general contractors, their associated subcontractors and employees recently received the Army-Navy "E" award for excellence in their work.

Argentina marks spending of $115,000,000 on roads

On the tenth anniversary of the passage of Argentina's National Highway Law, the nation's Ministry of Public Works recently issued a statement that it has spent about $115,000,000 on highway improvements and construction.

At the present time, Argentina has about 37,577 miles of highway, most of it divided almost evenly between national and provincial road systems. Additionally, more than 5,000 miles of roads have been built to connect railway stations and terminals with nearby communities and business centers, the ministry's announcement said. One road alone, linking Buenos Aires with the capital of the Province of Mendoza, is a 684-mile stretch completely paved with asphalt.

Until October, 1932, there had existed no suitable legislation for the establishment of an organic system and permanent funds for road construction. There were relatively few roads, and those suitable for year-round travel were very short. However, under the national highway law, a surtax was placed on the sale of petroleum, proceeds to be used exclusively for roadbuilding purposes.

• • •

Labor lack poses winter road maintenance problem

Albert L. Donnelly, director of roadway maintenance for the Connecticut Highway Department, said last week that the department is so short of labor that the highways cannot be properly sanded to combat ice conditions after snowstorms. "It will be a serious problem," Mr. Donnelly said, "to keep highways open and reasonably safe for driving."

The department has lost 20 percent of its labor crew, and it is estimated that a thousand men are needed to man sand trucks throughout the state when storms come. Traffic tie-ups have already occurred in Bridgeport, Norwalk, and Stamford, where road conditions have been particularly bad.

In an effort to remedy the situation, the department has authorized a minimum increase of five cents per hour for laborers, and has granted sick leave privileges. Additionally, appeals have been made to the U. S. Employment Service and Selective Service Boards for aid in maintaining the force at at least its present strength.

THE ALABAMA State Highway Department has granted leave of absence to 17 more employees who have entered the armed services to make a total of 444 employees who have enlisted in the Army.

JOBS OF THE WEEK

HOUSING, Texas
Public Housing Authority, Fort Worth, Tex., 500 family unit housing, from Kucharo-Union Construction Co., Des Moines, $1,053,180. Clarkson, Pilich Green & Rody, Fort Worth, architects.

HOUSING, Washington
Vancouver Housing Authority, received lowest bid 586 housing units, from Waale-Camplan Co., Portland, Ore., $1,298,000. Stanton & Johnson, Portland, Ore., are architects.

HOUSING, Connecticut
Public Housing Authority, NHA, Boston, Mass., received lowest bid housing at East Hartford, Conn., from Wadhams, May & Caney Co., Hartford, Conn., $641,750. S. F. Jeter, Jr., Hartford, Conn., is architect.

HOUSING, New York
Niagara Falls Housing Authority, Niagara Falls, received low bid from Wilcox Construction Co. and Bowen Fireproofing Co., Long Island City for housing, $1,463,000. Association of Licensed Architects, Niagara Falls, architects.

HOUSING
Housing Authority of City of Oakland, Oakland, 616 war housing units, to Monson Brothers, San Francisco. J. J. Donovan, Berkeley, is architect.

DRYDOCK
Chicago Bridge & Iron Co., Chicago, Ill., has been awarded contract two military type floating dry docks, for Bureau of Yards & Docks, Navy Dept., Washington, D. C., $3,440,000 and $2,840,000 respectively.

DRYDOCK
Bureau of Yards & Docks, Navy Dept., Washington, D. C., floating dry dock, to Tidewater Construction Co., 547 Front St., Norfolk, Va., $1,400,000.

DRYDOCK
Bureau of Yards & Docks, Navy Dept., Washington, D. C., timber floating dry dock, to General Constr. Co., Seattle, $770,000.

AIRPORT, Kansas City, Mo.
City of Kansas City, awarded contract airport at Grandview to Koss Construction Co., Des Moines, estimated cost $2,000,000.

AIRPORT, Seattle, Wash.
Civil Aeronautics Authority awarded contract for constructing airport at Bow Lake, to Minnis & Moody, Johnson, Inc., and Vista Constr. & Finance Co., San Bernardino, Calif. $2,418,744.

PLANT, Peru, South America
Vanadium Corp., New York, N. Y., plant for extraction of vanadium from ore to Rust Engineering Co., Pittsburgh, Pa. Estimated cost $4,000,000. Defense Plant Corp., Washington, D. C., will finance.

PLANT, Ashtabula, O.
National Carbide Co., Ashtabula, O., awarded contract plant to Rust Engineering Co., Pittsburgh, Pa. To exceed $2,500,000.

FACILITIES, Rhode Island
Bureau of Yards & Docks, Navy Dept., Washington, D. C., awarded contract additional facilities, to George A. Fuller and Merritt-Chapman & Scott Corp., New York, N. Y. $18,478,000.

IMPROVEMENTS, Michigan
U. S. Engineers, Detroit, Mich., improvements, Chippewa County, to Spencer, White & Prentis, New York, N. Y. Estimated cost $1,000,000.

TRAINING CAMP, Magruder, Va.
Doyle & Russell, Richmond, Va., has been awarded contract seabee training camp, by Bureau of Yards & Docks, Navy Dept., Washington, D. C., $10,200,000.

BUILDINGS, etc., Florida
U. S. Engineers, Jacksonville, Fla., awarded contract buildings, Howlands, Inc., Miami, less than $1,000,000; clearing, grubbing, drainage and grading to Hubbard Constr. Co., Orlando, less than $1,000,000; railroad spur track, to B. B. McCormick & Sons Co. and Okeechobee Constr. Co., Jacksonville, less than $200,000; paving runways, taxiways, and apron, to Herbert E. Wolfe, St. Augustine, est. $1,000,000, all foregoing Orange Co.

ROADS, Virginia
Virginia Department Highways, Richmond, Va., concrete and bituminous paving 13.76 mi. James City and York Counties from W. H. Scott, Inc., Franklin, Va., $1,257,737.

Note—Additional bidding and contract news on many projects large and small appear in the Construction News section beginning on page 85.

Photo by Three Lions

Roller brigade builds jungle airport

This photograph might almost be labelled "the charge of the roller brigade", as a team of eight American-built machines works feverishly to complete a hard-packed runway in what was once a dense jungle in Ceylon. Native laborers, who have been found to be apt pupils on the handling of big machinery of this type, provide the labor force.

NHA announces building of 2,000 homes for miners

More than 2,000 family dwellings to meet the urgent housing needs of nonferrous metal mining and smelting communities in six western states have been authorized and are already under construction, according to John B. Blandford, Jr., National Housing Agency administrator.

The houses, of temporary, row-type construction, will contain from one to three bedrooms each, and are being erected in fourteen communities by the Federal Public Housing Authority. Several hundred additional units in other communities have been authorized and should be under construction shortly.

The War Production Board was said to have granted a blanket priority certificate for materials for the needed housing before the specific projects were programmed. NHA made $8,000,000 of its funds available to finance construction.

Communities and states in which projects have been definitely assigned are: Utah—Garfield, Lark and Tooele; Arizona—Globe-Miami, Morenci, Bisbee and Ajo; Hanover, New Mexico; Anaconda, Mont.; Colorado—Leadville, Rifle, Uravan and Naturita; and Livermore, Calif.

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Georgia orders full payment of debt

The Georgia highway department and all other state agencies have been instructed by Gov. Eugene Talmadge to pay all their bills by Dec. 31.

This is to include payment on all outstanding certificates of indebtedness issued by the highway department. On Oct. 31, $3,320,848 in such certificates were outstanding.

WPB approves barge, tug program to ease oil pinch

With the approval last week by the War Production Board of an extensive barge, tugboat and tow-boat building program recommended by the Office of Defense Transportation, construction looking to the additional daily Eastward barge movement of 50,000 barrels of residual fuel oil will begin shortly.

This amount will be doubled in ten months. The program calls for 50,000 bbl. to move from Texas ports via the Gulf Intra-Coastal Waterway to Panama City, Florida, and the rest up the Mississippi to Cairo, Illinois.

In addition to the construction of 500 wooden tank barges, 21 steel-hull towboats, and 100 tugboats, the WPB-approved program includes erection of terminal facilities at Jacksonville and Panama City, Fla., and Cairo, Ill.

Transportation of the additional residual fuel oil, ODT officials said, may be expected to ease somewhat the shortage of petroleum products on the Eastern seaboard. Although residual oil of this type is used only by industrial consumers, the barge movement of 100,000 barrels daily will release other facilities for the transportation of other products.

• • •

Offer short, free course for women engineers

In view of a great demand in the government service for civilian junior engineers, the U. S. Civil Service Commission last week announced that women holding college degrees may now qualify for junior engineer positions by taking short, tuition-free courses developed by the commission and the U. S. Office of Education.

BRIEF NEWS

THE MILWAUKEE, WIS., public library has received a gift of $10,000 from the Milwaukee Scientific Educational Foundation—an organization promoted by the Engineers' Society of Milwaukee—for use in enlarging the scope of coverage of the library's science room.

MEMBERS of the International Salmon Fisheries Commission held sittings at Victoria, B. C., during December, and then adjourned to Seattle, Wash., to again inspect demonstrations of a working model of the Hell's Gate fish pass construction. Prepared by the commission's engineers at the University of Washington, the model shows conditions existing at Hell's Gate on the Fraser River. A temporary fish ladder has already been installed at Hell's Gate to assist salmon in reaching spawning grounds pending construction of a permanent structure.

COMPREHENSIVE programs of postwar public construction to conserve and improve rural lands are outlined in the "Public Works and Rural Land Use," a report transmitted recently to the President by the National Resources Planning Board.

PORTLAND'S new boulevard along the west bank of the Willamette River through the heart of the city was formally dedicated recently. R. H. Baldock, chief engineer of the Oregon state highway department, estimated the drive represents an investment of about $1,966,750 in construction and right-of-way costs.

MAYOR Frank Kelly of Chicago, Ill., said last week he had been advised that priority ratings needed for completion of the State Street subway had been extended by the WPB. The action clears the way for operation of trains over the new line by March, 1943, unless new delays develop, Kelly said.

STAGGERED hours have been made effective for about 300,000 employees of factories, offices and stores throughout Canada in a concerted drive to ease the wartime burdens on public transportation systems. Voluntary advisory committees are at work in most large cities, and it is expected the staggering will be extended to cover many thousands more employees in the next few weeks. Before gasoline rationing went into effect last April, traffic on Canada's public transportation systems had increased from 30 to 60 percent in the war period; and since the rationing has been in effect, increases have reached 50 to 100 percent.

OBITUARY

H. T. Terreault, 65, director of the Montreal, Canada, Town Planning Department, died December 18. One of Canada's leading civil engineers, Mr. Terreault graduated from the Ecole Polytechnique at Montreal in 1903, and was employed by the General Electric Co., Schenectady, N. Y., and the Cambria Steel Co., in Johnstown, Pa., before returning to Canada in 1915 to enter the shipbuilding field during the first World War. He became a member of the city's personnel in 1920, and after serving as director of public works, was appointed chief engineer of the Metropolitan Commission. He was named head of the Town Planning Department in 1940.

Percy L. Hoag, an engineer and contractor of East Hampton, N. Y., died there December 20. He had supervised engineering and construction of many home developments in the Long Island area.

John W. Melick, 80, one of the builders and chief engineer of the former Rockaway Valley Railway in New Jersey, died December 21 at Newark. Mr. Melick, in company with a partner, built the railroad between Morristown and White House, N. J.

Dominic F. Cherry, 77, retired civil engineer of Charleston, S. C., died recently there. A graduate of Clemson College, he once served as a civil engineer in Panama with the U. S. Engineer District office there.

Benjamin Schell Walters, retired civil engineer of Philadelphia, Pa., died recently at Merion, Pa.

George Henry Blakely, 77, a civil engineer who was vice-president of the Bethlehem Steel Co. from 1927 to 1941, and president of the Bethlehem Steel Bridge Corp. from 1916 to 1923, died at Newport, R. I., December 25. Mr. Blakely, a graduate of Rutgers College in 1884, was in private engineering practice from 1884 to 1888, before entering the employ of the Erie Railroad as a bridge engineer. He was chief engineer of the Passaic Steel Co. from 1890 to 1902, and later was manager of sales for the firm. Mr. Blakely had been identified actively with the construction of many important bridges and buildings, among them the Delaware River Bridge at Philadelphia, the Golden Gate Bridge at San Francisco, the Peace Bridge at Buffalo, the Merchandise Mart and the Field Museum in Chicago, and the Chase National Bank Building in New York City.

David Baker, 81, retired Philadelphia, Pa., consulting engineer, died recently at Wellfleet, Mass. A native of Boston and a graduate of Massachusetts Institute of Technology, Mr. Baker was associated with steel companies before settling in Philadelphia, where he was associated with James B. Ladd in the firm of Ladd and Baker.

Richard A. Sanders, formerly an engineer in the water and highway department at Providence, R. I., died recently at North Swansea, R. I.

Edward H. Sapp, 70, consulting engineer for the New York Shipbuilding Corp. of Camden, N. J., died December 14 at Wenonah, N. J.

Lewis D. Thorpe, 72, retired hydraulic engineer who was associated with many sewer and waterworks projects along the Atlantic seaboard, died at Emerson Hospital, Concord, Mass., recently. He had been city manager of Norwood, Mass., from 1925 to 1928.

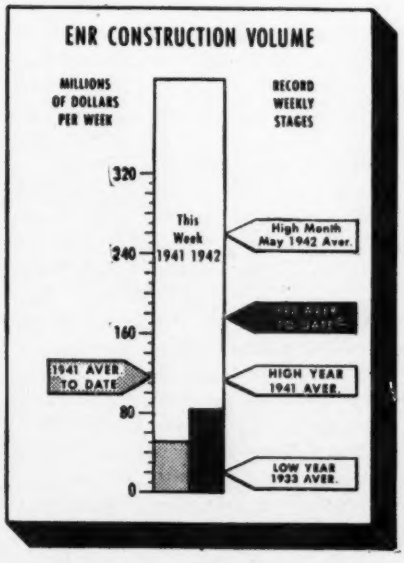
C. Joseph Early, 62, building contractor of Atlanta, Ga., died there recently.

L. L. Newton, 42, a contractor of Gainesville, Fla., died there recently.

CONTRACTS AND CAPITAL

ENGINEERING CONSTRUCTION volume for the short week due to the early closing for the New Year holiday totals $76,295,000, a gain of 129 percent over the volume for the short preceding week, and 39 percent above the total for the week ending January 1, 1942, as reported by *Engineering News-Record*. Private volume is almost six times as great as in the preceding week, but is 12 percent under the opening 1942 week's total. Public work tops a week ago by 123 percent and is 42 percent above a year ago as a result of the respective 111 and 98 percent increases in federal work.

Engineering construction for the 53 weeks of 1942, $9,305,829,000, compares with $5,868,699,000 for the 52-week period in 1941, an increase of 56 percent when adjusted for the difference in the number of weeks reported. Private construction, $555,823,000, is 54 percent lower than a year ago on the weekly average basis, but public work, $8,750,006,000, is 83 percent higher due to the 131 percent climb in federal work.



In the classified construction groups, gains over the preceding week are in bridges, industrial, commercial and public buildings, earthwork and drainage, streets and roads, and unclassified construction. Increases over the week ending January 1, 1942, are in waterworks, public buildings, and unclassified construction.

New capital for construction purposes for the final 1942 week totals $207,000, entirely in state and municipal bond sales.

New construction financing for the 53 weeks of 1942 reaches $10,219,318,000, an increase of 27 percent over the $7,895,129,000 reported for the 52-week period last year.

CONTRACTS

(Thousands of dollars)

	Week Ending Jan. 1 1942	Dec. 24 1942	Dec. 31 1942
Federal	$34,136	$32,051	$67,583
State & Municipal	17,509	813	5,727
Total public..	$51,645	$32,864	$73,310
Total private.	3,387	513	2,985
TOTALS	$55,032	$33,377	$76,295

Cumulative
1942.....(53 weeks).....$9,305,829
1941.....(52 weeks).....$5,868,699

Note: Minimum size projects included are: Waterworks and waterways projects, $15,000; other public works, $25,000; industrial buildings, $40,000; other buildings, $150,000.

NEW PRODUCTIVE CAPITAL

	Cumulative 1941 52 weeks	1942 53 weeks
NON-FEDERAL ...	$1,380,761	$640,132
Corp. Securities..	358,817	182,729
State & Mun....	439,203	217,248
U.S.H.A. loans...	30,399	.....
R.E.A. loans.....	100,500	.....
R.F.C. loans.....	288,842	157,455
Fed. Aid—Highways	163,000	82,700
FEDERAL	6,514,368	9,579,186
TOTAL CAPITAL.	$7,895,129	$10,219,318

ENR INDEX NUMBERS

Index Base = 100		1913	1926
Construction Cost...	Dec. '42..	283.69	136.37
Building Cost	Dec. '42..	226.63	122.51
Volume	Nov. '42..	462	202

FHA MORTGAGES

	Week Ending Dec. 20 1941	Dec. 12 1942	Dec. 19 1942
Selected for appraisal			
Title II. ..	$14,000	$3,878	$3,435*
Title VI...	$3,238	$5,744	$6,812*

* Subject to revision.

Comment and Discussion

Readers' opinions on matters that concern engineers and contractors

Emergency Steel Savings

Sir: Since the War Production Board's National Emergency Steel Specifications were issued, I have been studying their effect upon the design of structures already built. The results of a similar study were published in *Engineering News-Record*, June 18, 1942, p. 973, and some of those results have been tabulated below for comparison.

As before, I have arbitrarily studied the effect of increasing the unit stresses in tension and bending by one-third (as from 18,000 to 24,000 psi.), but with no increase in the unit stresses in compression. The savings in details are not great, because the unit stresses in bearing have not been increased and the unit stresses in shear on rivets and welds have been increased only slightly.

A general increase of one-third in unit stress should cause a decrease in weight of one-fourth. When only the unit stresses in beams, girders, and tension members are increased one-third, the resulting percentages of reduction in the total weights are naturally found to be much less than 25 percent, as shown by the accompanying table.

These studies are not exhaustive but are merely suggestive; no very definite conclusions can be drawn because of the number of variables. Obviously, the benefits derived by the use of the new specifications are much less than a proportionate amount of the increase in unit stresses, but they are not sufficiently consistent as to justify any generalization. Roughly, the amount saved in roof trusses is of the order of 5 percent for light trusses governed largely by minimum sections, or 10 percent when rather heavy loads are carried in addition to the roof. Beams and purlins are reduced about 12½ percent, and compression members not at all. The average saving in girders is properly more than in beams, but much depends upon the relative spans and loads, and upon the use of minimum sections.

The selection of the reduced sections depends upon good judgment, as well as upon the common factors, such as suitability, stiffness, minimum sections, commercial sections, slenderness ratios, deterioration, use of standard connections, and the proportion which the number of members bears to the total. It is presumed that a designer of a given structure would make his own comparisons of the weights of typical members of that structure, if he is interested in the saving of metal by the use of the new specifications as compared to the old. The study of these typical buildings may be of interest to some readers.

CARLTON T. BISHOP,
Associate Professor of Civil Engineering
Yale University

With a one-third increase of stress of steel in tension and bending but no increase in unit compressive stress, the savings below are possible.

Description	Classification	Weight, Kips	Percent Saved
280 x 350-ft. riveted locomotive and car shop with saw-tooth roof and crane runaways	Trusses	651	4.3
	Purlins	455	11.4
	Beams	108	12.0
	Girders	1,111	6.8
	Total	3,208	5.2
145 x 290-ft. welded power house with short-span flat roof and crane runway	Trusses	137	11.7
	Roof Beams	311	14.5
	Floor Beams	508	13.6
	Girders	201	16.1
	Total	1,602	10.2
100 x 200-ft. riveted mill building with pitched roof and monitor, 100-ft. span trusses and crane runway	Trusses	105	9.0
	Purlins	63	12.5
	Beams	81	11.2
	Girders	41	15.7
	Total	649	6.0
175 x 200-ft. riveted office and warehouse with heavy loads and provision for additional stories	Truss	146	11.0
	Beams	1,901	12.8
	Girders	866	22.0
	Total	3,786	11.8
140 x 780-ft. riveted rolling-mill building with pitched roof and monitor and 140-ft. span trusses supporting crane runways at the center	Trusses	960	9.0
	Purlins (trussed)	212	0
	Girders	271	0
	Total	1,943	4.4
75 x 415-ft. riveted locomotive shop with 75-ft. span flat-roof trusses	Trusses	90	5.1
135 x 340-ft. welded structural warehouse with 135-ft. span curved-top-chord roof trusses	Trusses	61	9.2
225 x 885-ft. riveted manufacturing plant with three-span continuous flat-roof trusses	Trusses	542	5.6
400 x 1,000-ft. riveted airplane plant with cantilever roof trusses supporting crane runways	Trusses	1,900	5.3
Heavy riveted 300-ft. span end roof truss in a bomber plant to support an 80-ton canopy door	Truss	200	9.6

Belt Placed Fill for Early Dam

Sir: Reference is made to *ENR* p. 777, Dec. 3, 1942, stating the belief that the belt conveyor placing the Youghiogheny Dam fill is the first use in the United States of such equipment for that purpose.

The *Engineering News* of April 22, 1915, p. 758 contained a description of Lahontan Dam construction, in Nevada, in which a 30-in. belt conveyor 925 ft. long was employed very advantageously for delivering all the embankment material onto the dam.

Not only was this unprecedented conveyor the main transportation equipment, but it served by transverse feeder bolts for accurate measurement and proportioning of the two elements of the earthen embankment. The delivery of the measured proportions of gravel and silt was into a gravity mixer-hopper. They were then chuted into dump wagons for distribution in 3-in. layers onto the dam, where the material was treated for "optimum" moisture and rolled by a 10-ton diesel-powered roller.

It is believed that the nearly "all-electric" construction plant of 30 years ago was truly a pioneer in its way. The plant employed the first electric power shovel and dragline excavators, with electric drive for the long span traversing cableway and all electric motors for belt conveyors in the embankment and concrete pro-

duction, also for the cement manufacture and all auxiliary equipment.

D. W. COLE,
Civil Engineer
Marietta, Ga.

Engineers Should Travel

Sir: I note the comment of A. B. Sleath in *ENR*, Nov. 19, p. 695, ending with "engineers are working everywhere but at home."

I fought that travel notion for many years because I wanted to "stay at home," but in later years found that an engineer that stays "at home" does not develop the breadth of experience gained by one who is willing to travel; the job I'm on now had certain of its features designed by men who work normally in dry climates, and they made no provisions for drainage, so now those of us on the job have to wear rubber foot gear most of the time; those designers should have had more travel, should have been forced to contend with more varied experiences than they evidently ever had.

So I contend that wide travel is a necessary addition to an engineer's training, let 'em go far and wide, especially in their younger years.

R. F. MIRICK
Construction Engineer,
Evansville, Ind.

Design of Timber Frames

Sir: In the December 3 issue of *ENR* two errors occurred in my article "Designing Rigid Frames in Timber". On page 791 in Fig. 2 the dimension of the ridge frame is 12x16 in., instead of 12x6 in., and on page 792 in the eleventh line of the left column the formula should read $N_w = +\frac{1}{2}\,\frac{wh^2_t}{L}$. The printer left out the term L in setting this line.

JARO J. POLIVKA,
Civil Engineering Research Associate,
University of California,
Berkeley, Calif.

Truck Mixer Washwater

Sir: I wish to add to the discussion on wash water in this article "More Production from Truck Mixers," *ENR*, Sept. 10, 1942, p 360.

On a recent paving project in New Jersey truck mixed concrete was specified. The specifications also ordered washing-out after each load (3.5 c.y.). At the completion of each day's paving we noted that the actual yardage laid did not approach the theoretical by 5 percent. The grade, forms and screeds were checked very carefully but the loss of material continued.

Finally, we had five trucks dump their 25 yd. of wash water from one trip into 55 gal. drums. After allowing this to settle overnight and draining off the water we found an average of 2.6 cu.ft. of cement, sand and a small amount of coarse aggregate from each truck.

The conclusion is reached that washing out after every load is harmful to the concrete because a sizable amount of cement is lost. The loss of volume also increases the cost of a project considerably. I can see no harm to the concrete if the amount of wash water is measured accurately and allowed for in the following load. Trucks should be washed out about twice a day so that the drum is kept clean.

J. EDWARD CRABIEL,
Engineer, Franklin Contracting Co.,
Newark, N. J.

Supply of Engineers

Sir: I have read "Keeping Up the Supply of Engineers" in the Dec. 3 issue, p. 765, and agree emphatically with your comment that the engineering schools ought to be utilized to the maximum for the training of technicians to meet the requirements of the armed forces and war industries. This institution is already carrying a considerable program of that type of training and is attempting to expand that part of its program. We have no feeling that by so doing the quality of the regular training in engineering will be diluted.

The comment which has appeared in many places and is also in this editorial, that parents could send their boys to college to escape the draft while boys of similar ability but lacking financial resources would be drafted, is not in accordance with the facts insofar as this institution is concerned, and probably we are no different from most of the land-grant colleges. A survey of the occupations of the parents of the present senior engineers at this institution shows a surprising distribution, as is seen in the records of 165 engineers who have graduated or will graduate in 1942. The distribution according to occupation of parents is as follows:

	Percent
Farm owner or operator	21
Professional occupations (teacher, engineer, lawyer, dentist doctor, minister, etc.)	19
Semi-skilled and skilled trade	17
Owner of business, such as limber yard, seed store, retail mercantile establishment and the like	16
Business executive	9
Salesman	9
Public official or government employee	5
Miscellaneous unclassified	4

It is apparent from our records that whether the boy attends college or not depends upon his own ambition and ability as much or more than upon the financial support his parents can give him.

T. R. AGG
Dean, Division of Engineering
Iowa State College,
Ames, Iowa

A Job to Do

We, who have to stay at home, must devise the means and make the plans now for the billions of dollars worth of homes and industrial and public improvements which we know we will need. We must make complete and detailed plans now; we must prepare the specifications and even the proposal blanks now. Adequate time for study of each project and its relation to all other projects is available now. That means we shall not waste our efforts nor the work of the men who will need the jobs and to whom we owe, and always will owe, an opportunity to earn an honest, decent living in a democratic country.

If we do not make plans now, plans ready to let contracts on, we face the disgrace and disaster of another WPA or an even worse situation if that is possible. For, let there be no lazy dodging of the evident fact, we will owe those men jobs, and they will have to have work immediately upon their discharge from the Army or Navy. Unless useful projects are made ready by the proper authorities there will certainly be unemployment, or a dole, or, God forbid, another WPA, probably with changed initials. No self-respecting or sensible citizen wants another WPA and the two-fisted men in our fighting forces don't want it. You can bet your last War Bond on that. So we have a job on our hands, now.

From "THE CONSTRUCTION ADVISOR"
Publication of the Associated General
Contractors of Missouri

EDITORIALS

VOLUME 129 NUMBER 27

December 31, 1942

International Standards

A PROGRAM of Inter-American cooperation on engineering standards, just launched by the American Standards Association in order to speed up production and conserve materials during the war emergency, is bound to have a beneficial long-time effect. Nothing throttles international trade—and international cooperation on construction—more than differences in materials specifications and equipment details. If a country can readily give its customers products that fit into its existing industrial and construction practices, by virtue of international standards, a big chunk of sales resistance is immediately eliminated. And in wartime, cooperation among allies is greatly improved if parts and details are interchangeable. Lack of such interchangeability is already causing trouble in North Africa, where American threads and pipe sizes are different from those in current use. Similar difficulties are being experienced with other lease-lend supplies. It is probably too much to hope that American standards can be made world wide, but in Latin America, at least, there is opportunity for making their acceptance more frequent and their use more general. There the ASA project should prove mutually beneficial.

Floating Stone

AFTER A 25-YEAR INTERVAL we are again engaged in an extensive program of reinforced concrete ship construction. When the first of these ships built under the new program was exposed to view by the stripping of forms, a very satisfactory job of concrete construction was found. Form stripping in an adjacent dock a few weeks later showed an even better concrete surface, and prospects are that further experience will improve quality and decrease construction time. A major problem is that of keeping the specific gravity of the concrete down to the desired figure. If the light-weight aggregate could be made still lighter without sacrificing strength, that would help, and it is unfortunate that no light-weight substitute is available (at least at the yard described in this issue) for the fines that now have to be supplied by ordinary sand. With the advances that have been made in the past quarter-century in knowledge of how to proportion, mix and place concrete, it was a foregone conclusion that the concrete in these ships would be better than in the craft turned out in World War I. Obviously the ships now under construction provide much needed capacity, quickly and with reduced use of critical materials. How they will show up in actual service depends in part upon their ease of repair and in part upon their operating costs, which will be affected by their greater net weight as compared to ships of steel or of wood. The final test comes in actual sailing service.

Lifeline for Victory

AMONG THE SPECTACULAR construction projects inspired by the war, the "Big Inch" oil pipeline from Longview, Texas, to the Atlantic seaboard is one that captures the imagination. Now almost half completed, this 24-in. pipeline, stretching across 1,250 miles, ranks as the largest in diameter and the longest conduit ever laid to carry crude oil. Aside from these distinctions, the project is being executed with a fervor that has resulted in record-breaking installation, every indication pointing to completion of the line in less than a year. In the matter of speed and adaptation to new conditions, the "pipeliners", along with their colleagues who are building ships, drydocks, industrial plants and all the other war facilities, are performing miracles. Engineered-construction achievements of this kind are making victory secure.

Public Health and Engineering

THE CLOSE RELATIONSHIP between sanitary engineering and the work of the medical profession is demonstrated by recent studies at the University of Michigan, concerned with the efficacy of water treatment in removing poliomyelitis virus. When the medical profession discovered that polio virus was present in sewage-polluted waters, it proclaimed a challegene to the sanitary engineer to contribute his best efforts in the war on infantile paralysis. As reported elsewhere in this issue, the challenge has not been ignored. In making public an interim report, the University of Michigan engineers and doctors reveal that no single unit of certain standard water purification processes will remove the virus completely. Forthcoming studies are expected to evaluate the efficacy of combined processes. When these results are available, the sanitary engineer should then be able to strengthen the bulwark of defense against disease transmission.

Emergency Training

ANNOUNCEMENT of the Army and Navy plans for training a large number of enlisted men in colleges and universities answers a few of the many questions raised as to the effect of the lowered draft age on engineering training, but leaves many still unanswered. Chief questions for the educators are what schools are to be taken, how many men they will be asked to train, and how many men will be left in the non-military courses. In so far as engineering students are concerned, instructions to draft boards to defer students who have completed one year's work until the end of the semester that is under way on March 1 will be of some help in keeping the work from being badly disorganized. But at best the next few months are going to be trying ones for the engineering schools.

The Army's requirement that all drafted men take 13 weeks of basic training before being returned to the schools will add to the disorganization, yet from the viewpoint of building the best possible army in the shortest possible time, that plan deserves more praise than it has received so far. And after the disorganizing effect in the initial period is past it should aid in putting engineering training in the war period on the best possible basis. In that 13 weeks of intensive military training, the Army will have learned the military potentials of the men. Therefore, there should be a minimum of misfits returned to the colleges for training. Also, the men will be better disciplined and easier to train. And if the sifting is well done during the 13-week period, it may winnow out many men lacking in what it takes to make a good army officer but capable of being trained for useful work in a war industry. There might be enough of these boys to permit a few schools to continue to teach fairly normal engineering courses.

In the long view, both the Army and Navy plans may prove to be highly beneficial to the engineering profession. Taken together, these training programs will expose a very large number of the abler and more ambitious high-school boys to engineering training, a much larger number than normally enter engineering schools. Obviously, many of these will not come back, but it seems logical to conclude that of those who do go back to college in the post-war period, the percentage of potential engineers of high caliber will be higher than of the average freshman class in past years. Hence, though the war-training program may temporarily cut off the supply of engineering graduates, it also may increase the number of real engineers to be graduated in future years.

Soil-Cement Comes Into Its Own

AMONG THE RECORD-BREAKING performances that civil engineers and construction men have turned in on war jobs, none is more spectacular nor significant than the paving of an airbase with soil-cement at an average rate of nearly 1,000 sq. yd. an hour, and reaching up to a maximum of over twice that, as described elsewhere in this issue. As recently as March, the record was only about 500 sq. yd. an hour. What this means for post-war roadbuilding is plainly evident.

Behind this record of achievement is another of those familiar stories of careful laboratory research, studied field experimentation and progressive development of construction procedures. Thanks to the engineers of the Portland Cement Association, the "spade-work" of soil-cement techniques was complete when war demands arose. Thanks to the Corps of Engineers, early opportunities were afforded to try out these techniques in the field. And now, thanks to roadbuilding contractors and their engineers, and to the manufacturers of special equipment, mass production of high-quality soil-cement surfaces has been achieved.

Consider, for example, the progress in spreading the cement. On an airbase built in January, sacks of cement distributed along the runway were opened by hand, and the cement spread by blade grader. In March, on another job, sacked cement was emptied into a three-hopper distributor pulled behind a truck and dropped in three parallel lines. On the job described in this issue, bulk cement in huge tank trucks is discharged onto a rotating cylinder that spreads it in exact amounts in a thin layer that can easily be mixed with the soil. Equally significant progress has been made in moisture application and control, in mixing technique and in use of equipment.

For such achievement, road builders take their place beside the contractors who have built cantonments and war factories at such medal-deserving speeds. And, as a consequence soil-cement emerges as a surfacing material that will command careful consideration by both post-war highway engineers and airport specialists.

ENGINEERING NEWS-RECORD WALDO G. BOWMAN, *Editor*
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Sideshell forms near completion as closing section is prefabricated in background.

Building Concrete Ships In Prefabricated Forms

***Contents in Brief**—The first of the 14,000-ton seagoing concrete barges of 56-ft. beam, 38-ft. depth and 375-ft. length, built in three pours according to Maritime Commission specifications, showed up well on inspection after form stripping, and also under hydrostatic test. Outside forms are handled in full-height sections (30x38 ft.) weighing up to 12½ tons. Construction speed is improving as experience is gained in setting up forms, assembling large reinforcing steel units and making the long continuous pours.*

Moving an 11-ton form assembly from prefabricating yard to its designated place in the construction dock.

BUILDING GIANT concrete seagoing barges is again an important project in the construction industry, as it was in World War I. To conserve critical materials while meeting the urgent need for more bottoms, the Maritime Commission has let contracts for a large number of barges to be built in Atlantic, Gulf and Pacific yards, designed for the coastal transportation of oil. Their gross weight is 14,000 tons and the cargo capacity is 50,000 bbl. Dimensions are: length, 375 ft.; beam, 56 ft.; depth, 38 ft.

Construction started on the first barge, in a West coast yard, on April 23, 1942, and the first launching came six months later (*Engineering News-Record*, Oct. 22, 1942, p. 535). Speedier construction, however, is planned for later vessels. Hull No. 3, at the yard that made the first launching, is expected to be completed in 60 days, with still better speed on later vessels.

Forms were being stripped from the second barge when the West Coast shipyard that made the first launching was visited recently to obtain data for this article. All concrete structures make a sort of debut when the forms are stripped, and this is particularly true for large seagoing craft in whose thin walls water-tightness is an all-important consideration. The first hull to be stripped had shown only a few "pockets" in the concrete such as could easily be made good with patches. The second hull made a much better showing (reflecting improvement with experience of the crews in concrete placement), and

produced an excellent, uniform surface finish on dense concrete.

Plan of construction

The construction plan at this yard is to assemble forms and pour concrete in the dry in a group of graving docks. When a vessel is ready for launching, the dock is flooded, the vessel is floated out, and the dock is prepared for a new cycle of operations. Wellpoints and deep-well pumps make it unnecessary to give the docks a lining designed to resist water pressure.

As first planned, each dock was to have its outer end closed by steel sheet piling supported by an earth fill, this cofferdam to be removed for each launching and later replaced. Due to operational difficulties with this type of cofferdam, a floating gate was designed and constructed, speeding up the launching operations and freeing much-needed equipment. This gate is a reinforced concrete box 10x75 ft. in plan and 28 ft. high. It is divided into compartments by vertical walls, is heavily ballasted with concrete at the bottom and has a horizontal slab two-thirds of the way up.

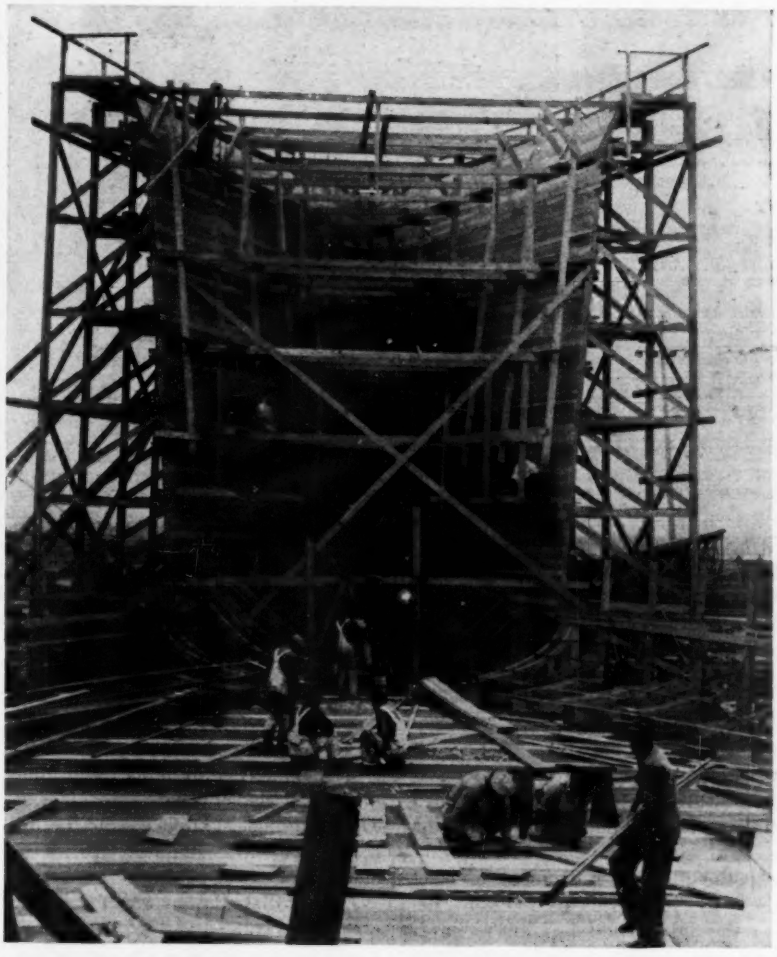
The shipyard is divided into four major sections: graving docks with outfitting pier, form yard, reinforcing steel yard, and batching plant. In the form and steel yards, provisions have been made to fabricate and assemble sections within the capacities of the cranes. Each yard is laid out to operate on the straight-line production basis with raw materials entering one end and finished members or assemblies emerging from the other.

Yard operations

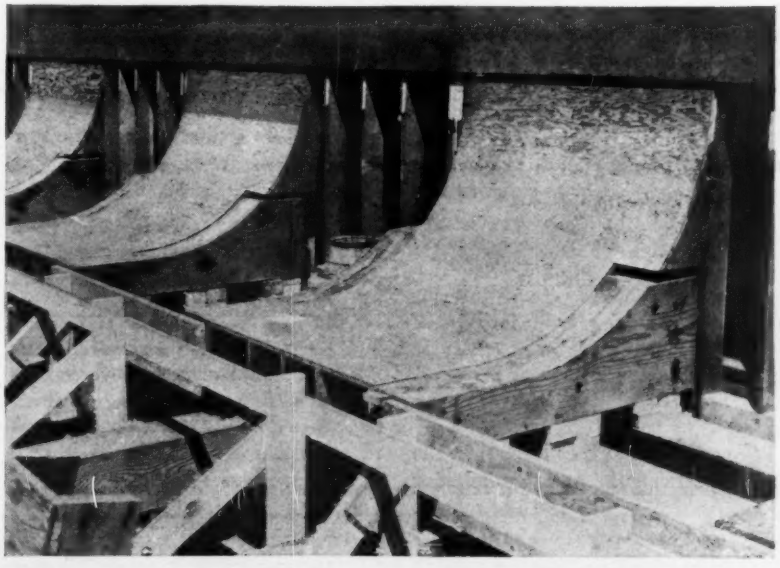
Exterior form assemblies are built on an open "mold loft", which differs from the lofts used in constructing steel ships in that concrete forms instead of templates are the product. In the concrete shipyard the form of the ship is actually built up, in sections, in the mold loft.

The heaviest form sections are near the prow and the stern. In addition to having much the same height and length as sections that go amidships, these forms require a depth (athwartships) of about 15 ft. These heaviest sections weigh 12½ tons. Amidships sections are simple, straight forms, all of the same type, and are built out in the yard, not in the mold loft.

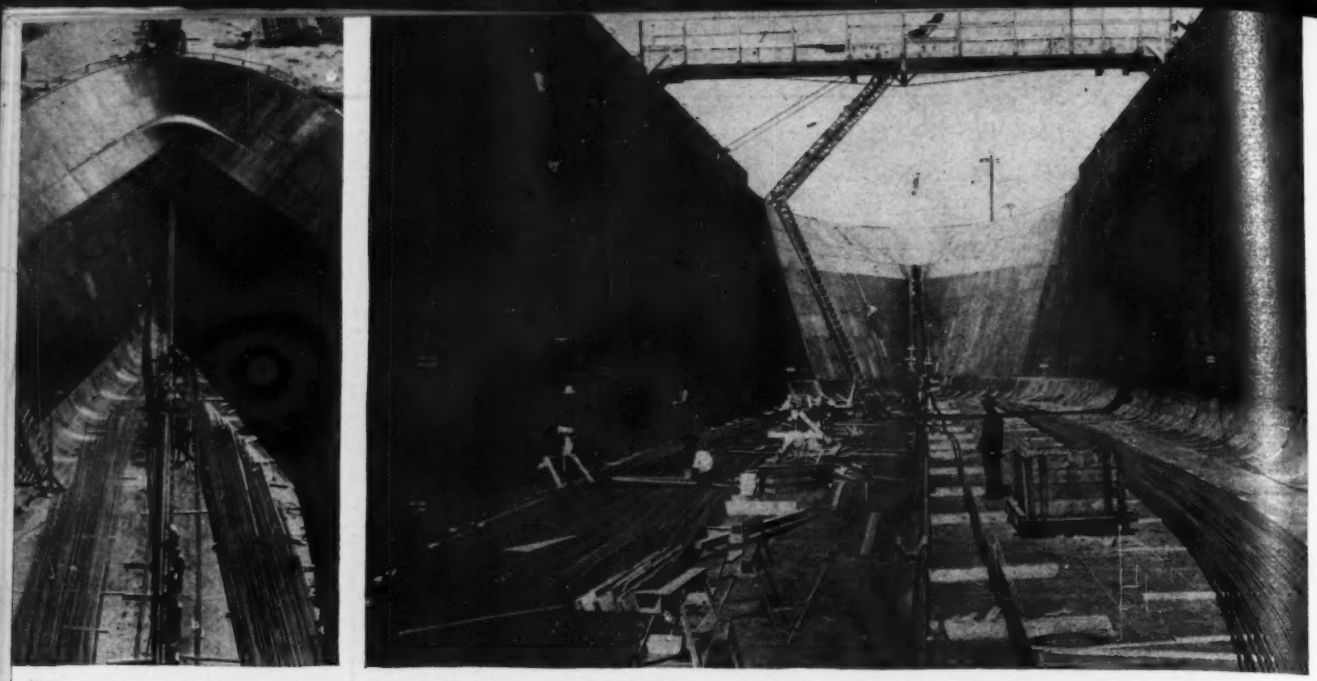
These forms are handled on a revolving crane (40-ton capacity) figured for 15 tons at a boom radius



This prow form, being built in the open air "mold loft" of the prefabricating yard, will be moved bodily to the construction dock. Sections are laid out on the "loft" floor to assure compliance with the designers lines.



Bilge forms are set in small sections and are not made to fit exactly along top edge. This space is filled in after adjoining forms are placed.



Reinforcing bars, continuous for the full length of the ship, are made up of 80-ft. lengths flash welded together on shore and pulled into the ship through a hole in the stern. Right: Hanging full-length longitudinal bars on the outside form of the shell. The bars are pulled into the ship from the fabricating yard in the trough made of steel sheetpiling.

of 90 ft., which is almost horizontal boom. Small form pieces are moved about the yard and to dock side by a straddle-type lumber carrier.

Reinforcing steel comes to the yard in 80 ft. lengths and is stored in bins made by driving steel sheet piling into the ground. Movement of steel about the yard is by truck cranes using special 2- and 3-point pickups. A standard gage flatcar 58 ft. long has also been designed to facilitate movement of the reinforcing steel rib assemblies, which are set up vertically in storage and are handled in the same position.

Yard equipment expressly for use with reinforcing steel includes a circle bending table, stirrup benders and shears. The longitudinal reinforcing bars are welded outside the ship at a location whence they can be dragged (in lengths up to as much as 250 ft.) into the ship through the open inshore end, sliding in a trough made of steel sheet piling laid along the keel of the ship. Tractive effort for dragging the long bars into place is supplied by a compressed air hoist at the offshore end of the dock.

Placing forms and reinforcing

Construction procedure in the docks begins with placing the floor panels, bilge blocks and outside forms. The bilge extends to a height of 4 ft. 5 in. and it is to this point that the first pour is made. The outside forms are fabricated in panels 38 ft. high by 30 ft. wide and those amidships weigh about 11 tons each. These panels are lowered by the crane almost exactly into place, and final alignment is effected by wedging. The wedging is knocked out before the forms are removed prior to launching.

After initial alignment of the forms, placing of the steel is commenced. There are two courses of longitudinal reinforcing steel (1 in. round and $\frac{7}{8}$ in round) in the bottom and sides of the vessel. The outside steel is hung on steel spacer bars, bolted to the forms and then the preassembled ribs are placed. The inside reinforcing steel is then woven in. Steel in the bottom and in the deck is butt welded, giving the effect of continuous bars from stem to stern. Circumferential bars are also welded. Small, 200-amp. welding machines are located on staging around the vessel for this field welding.

Spacing of the longitudinal reinforcement varies from $3\frac{1}{2}$ in. in the bottom to 6 in. in the shell at deck level. Throughout the shell and the bottom, $1\frac{1}{4}$-in. square transverse bars are placed between the ribs, of which there are 66. Reinforcing for these ribs, which are spaced on $5\frac{1}{2}$-ft. centers, is fully assembled in the steel yard in units that weigh 12 tons each. These ribs are about $15\frac{1}{2}$ in. wide by 20 to 24 in. deep.

The hull is divided into compartments by transverse bulkheads and a longitudinal bulkhead extending along the center almost the full length of the ship. Steel for the transverse bulkheads is also assembled in the yard into units that weigh 24 tons each. The two layers of longitudinal bars and the transverse bars are tack welded at all intersections.

Large quantity of steel used

Total steel requirement for these vessels, including the steel rudder and rudder post, is about 60 percent of the quantity of steel required for the same capacity vessel of conventional steel design.

High lights of the reinforcing steel operations are as follows: 70 percent of the total reinforcing steel tonnage is in the hull before the first concrete is poured; stirrups in the ribs are butt-welded in contrast to the conventional hook design; close tolerances are required in this heavy steel fabrication because of the $4\frac{1}{2}$-in. shell.

With outer forms at full shell height, when the steel in floor and frames is completely in place, the inside forms, up to elevation 4 ft. 5 in., are set, in 18 in. steps as the first concrete pour is progressively made. This elevation of 4 ft. 5 in. was adopted as a standard division in concrete pours, due to the experience gained in the construction of the first vessel.

In the first hull, the bottom pour included the sides up to about 11 ft.

and all interior bulkheads up to that level. With a first pour extending this far, there remained a total of only about 1,000 cu.yd. to be made in the second pour to bring the shell up to deck level. On the first hull, this second pour of 1,000 cu.yd., also in 18-in. lifts, was made in a continuous 69-hr. run.

On the second hull, because the initial pour had been stopped at a height of only 4 ft. 5 in. and included none of the transverse bulkheads, the second pour required some 1,600 cu.yd. to bring the concrete up to deck level. Illustrative of the rapidly improving technique after experience on only one barge, this 1,600-cu.yd. pour was made in a continuous 56-hr. run, 13 hr. less than was required for the corresponding 1,000 cu.yd. poured on the previous hull.

After the first pour is completed and the inside forms stripped, the transverse bulkhead steel is set and preparations are made to place the inside forms, from elevation 4 ft. 5 in. to deck level, for the second pour. The faces of the transverse frames are tied to the outside forms by shebolts, which also are used extensively throughout the hull for aligning the steel. After the second pour, the deck steel goes in rapidly and the deck is poured.

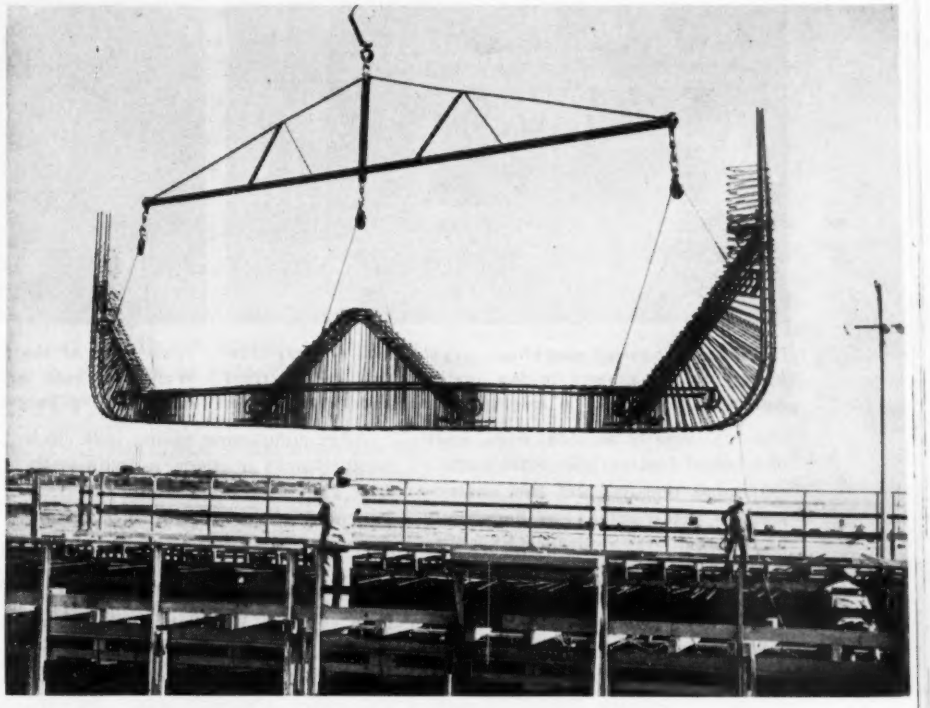
Because the outer forms are all in place when concreting starts, delivery of concrete is made with crane and bucket, lifting up and over the forms to deliver to hoppers that charge hand buggies operating on runways. Concrete is supplied by a batching plant whence the buckets are delivered by truck to the crane boom. Interior forms, as stated, are built up in 18-in. increments and thus concrete ordinarily does not drop more than 18 in. after its discharge through a trough whose lip overhangs the inside form.

In addition to the three principal pours, there are also several relatively small items of concrete placement. These include the forecastle deck, which is 9 ft. above the main deck and supports the anchor winch; the poop deck, also 9 ft. above the main deck, on which is placed the fuel oil tank for the operation of diesel-driven generators; a frame constructed wheel house; also, bollards and arrangements for towing another barge aft; and finally, the pump house, situated amidship and housing all oil pumping equipment. These pours, totaling about 1,000 cu.yd. are made at the outfitting dock.

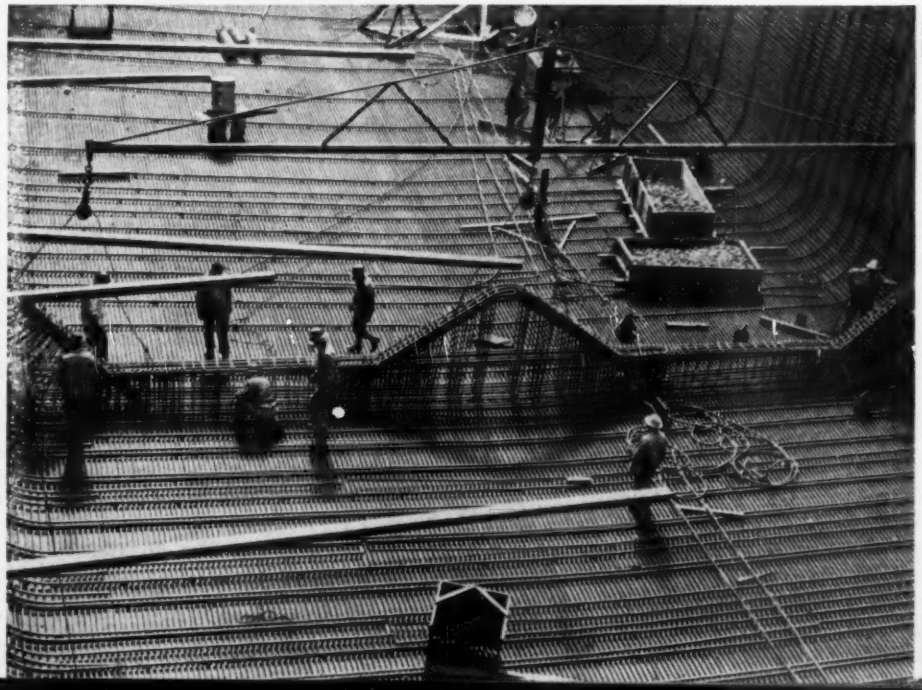
Thickness of the concrete shell is 5 in. across the bottom and up around the turn of the bilge where the thickness begins to decrease until it becomes 4½ in. at the 18-ft. level, which thickness extends to the deck. This is the minimum thickness in the outer shell of the vessel.

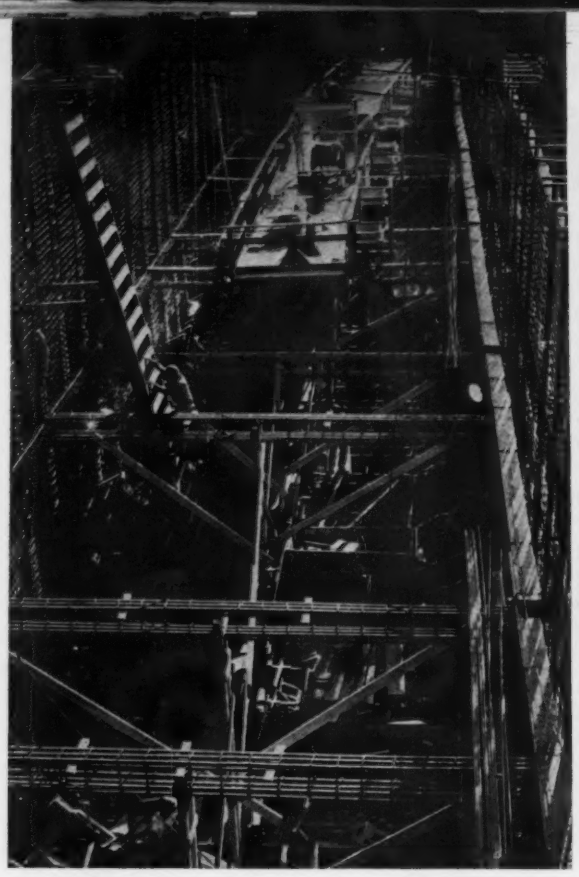
The subject of weight has been given careful study, particularly with respect to the materials used in making the concrete. Concrete weight in the first two vessels is said to be about 124 lb. per cubic foot. This was with light-weight aggregate with a specific gravity of 1.6. It had been hoped that the specific gravity of this aggregate could be kept as low as 1.2, but because the smallest available size of the lightweight aggregate

Prefabricated reinforcing cage for the bottom of a rib is being moved into place, using a special three-point pickup truss and tackle.



A rib cage is landed in the hull. First longitudinal steel is already in place, and a second layer will be woven through the rib.





For concrete pouring operations, buggies take delivery from hopper on the runway in top center. Steel on the right marks the position of a longitudinal bulkhead of the ship.

Prow view of the first concrete ship ready for launching. Water has been let into the construction dock by removal of a floating concrete caisson gate at the outboard end.

was too large to serve as fines, ordinary sand had to be used to attain maximum density, and this contributed to making the specific gravity higher than was desired. The objective is a light-weight aggregate that will produce concrete weighing not more than 110 lb. per cubic foot.

Concrete vibrators are used in three positions: (1) against the forms, (2) on the projecting bars, and (3) as bayonet type vibrators inserted in the concrete itself. This does not hold for the shell walls, however, which are considered too thin for vibrators to be used on the steel. Cement content has varied; the average is about 9½ sacks per yard. Specifications call for 5,000-lb. concrete in 28 days.

Stresses and tests

All reinforcing steel in the hull below deck level is figured for a working stress of 12,000 lb. per sq. in., while steel in the 4½-in. deck is stressed up to 16,000 lb. per sq.in. Suggestion has been made that dead weight of the barges could be materially decreased if working stresses in the steel were increased to 16,000 lb. in the hull and 20,000 lb. in the deck.

After completion of the hull, each compartment is given a hydrostatic test. This is done by filling the compartment with water and fastening down on the compartment hatch a watertight cover, through which a 4-in. pipe is carried 10 ft. above deck level. Filling this pipe with water brings the hydrostatic head on the bottom of the compartment to 48 ft. In some compartments, outward signs of moisture were developed under this test, but nowhere did flowing leaks appear. Wherever there was any indication of sweating, the wetted area was cut out and a patch was put in.

These tests are said to be highly satisfactory in showing the compartments to be practically "bottle tight"; no measurable loss of water occurred during the test. Test pressure on each compartment was continued for 3 hr., and inspection was made at the end of this period.

As bumper protection against abrasion of these hulls, three longitudinal runs of wood fenders are bolted above the water line.

Final treatment of the concrete surface on the hull exterior below the water line consists of three coats of coal tar paint and then a coat of copper sulphate anti-fouling compound. The interior concrete surfaces of the oil cargo tanks for Hull No. 1 are treated with a 3-coat application of "Amercoat", and the interior concrete surfaces of the ballast tanks with a 3-coat application of "inertol".

Data announced on the first concrete barge at the time of launching included the following: Cement used, 8,750 bbl.; concrete, 3,100 cu.yd.; weight at launching, 6,400 tons; draft (light), 16 ft. 9 in.; draft (loaded) 29 ft. 6 in.; load capacity, 50,000 bbl.; lumber used in forms, 1,200,000 ft. b.m.

Construction personnel

The work at this yard is being carried out under contract with the U. S. Maritime Commission by Concrete Ship Constructors, a joint venture, composed of the Tavares Construction Co., Inc., and Elliot, Stroud-Seabrook. The management includes Carlos Tavares and R. S. Seabrook, managing partners; D. M. Callis, naval architect; John Meentz, general superintendent; R. Howard Annin, consulting structural engineer; Gregory D. Smith, administrative manager; and T. W. Eisenman, project engineer.

ALCAN—AMERICA'S GLORY ROAD

Part II—Supply, Equipment and Camps

Harold W. Richardson
Western Editor, Engineering News-Record

This is the second of a series of articles on the Alcan Highway. The first, appearing in the Dec. 17 issue, told of the purposes of the project and the route location. Part III, covering the actual construction operations, will appear in the Jan. 14 issue.

OFFICIALLY it may be Alcan, but to the boys on the project it is the "Oilcan" Highway because of the hundreds upon hundreds of gas and diesel fuel drums scattered over the full length of the road. These steel drums are symbolical of the problem of supply. Building of the route involved far more than mere construction. To get equipment and supplies to the thousands of troops and civilians engaged on the project was no small job. Not only did such materials have to be transported long distances from the United States, but they had to be distributed along 1,800 miles of road being built through raw wilderness, often over stretches of rough trail that defied any kind of transportation.

This article will deal with the problems of supply and subsistence, the camps and headquarters facilities, and conditions under which the soldiers, engineers and contractors lived, worked and moved.

There are three major supply routes to the project: (1) via rail to Dawson Creek; (2) by boat to Skagway and rail to Whitehorse; (3) by boat to Valdez and highway to Gulkana and Big Delta. The west coast ports of Skagway and Valdez, Alaska, are served from both Seattle, Wash., and Prince Rupert, B.C. A fourth route was possible via the Alaska Railroad from Seward to Fairbanks, and thence by road to Big Delta, though this route was little used.

Railheads are being built at both Dawson Creek and Whitehorse for transfer of freight from rail to trucks for transportation over the road. The Dawson Creek setup is quite elaborate, for this will be one of the main points of supply. It includes miles of sidings, many warehouses, unloading platforms and barracks for housing the freight handlers and truck operators. All subsistence and supplies for the Army are handled at the main points by quartermaster detachments and distributed through the supply detachments of each engineer regiment. Keeping scores of camps supplied over trail roads last summer was a big job. Often it was necessary to drag supplies to the head crews by tractors and sleds through the mud, and later a fleet of tractor wagons was obtained for this same purpose.

Route of the Alcan Highway and its supply lines. The connection from Haines is now under construction to relieve the load on the W. P. & Y. R. R.

Dawson Creek, B.C., southern terminus of the Alcan Highway, is at the end of rail. A standard-gage branch railroad, the Northern Alberta, connects this outpost with the main-line Canadian National and a branch of the Canadian Pacific at Edmonton, Alberta, 500 miles to the southeast. All supplies for the southern sector of the highway and all war material for Alaska routed this way comes into Dawson Creek over the Northern Alberta. A long, poor, provincial highway, passable only in fair weather, between Edmonton and Dawson Creek, does not figure in the Alcan plans. One contractor wheeled a few trucks into the job over it last summer, but the experience was not worth repeating.

At first facilities for unloading and transferring at Dawson Creek were wholly inadequate. Just as fast as possible, unloading tracks were extended and platforms were built. Some of the platforms were later housed over as warehouses, but in the meantime the materials, including perishables, were protected from the weather by canvas. The temporary railhead developed into a substantial installation, including insulated storage space for foods and a battery of refrigerators. Complete and adequate facilities of all kinds are provided in the new railhead, built late this fall.

The supply route through Skagway, Alaska, is particularly interesting. Some of the equipment and materials come in by boat, including towed schooners, which are unloaded at the wharf, but most of them are shipped from the West Coast terminals of Prince Rupert, B.C., or Seattle, Wash., in barges towed by tugs. As there is a 20-ft. tide at Skagway harbor, which is at the head of the Inside Passage,

Distribution of gasoline and diesel fuel to thousands of construction equipment units along the highway is a major supply problem. Scenes like this cause the men to dub the road the "Oilcan Highway".

the barges are pulled in at high tide and beached at low tide to be unloaded by crawler cranes working from the dry, hard beach. Extensive improvements now under way in the harbor will provide a long barge slip alongside a fill whose top is above high tide level, so unloading can proceed at all times regardless of the tide. Material removed to create the deep slip makes up the embankment from which the unloading cranes will work. At present it is necessary to move or haul all supplies and equipment unloaded from the barges immediately to ground above the high tide mark.

Everything coming into Skagway must be moved over the 3-ft. White Pass & Yukon Route Railway to Whitehorse, 111 miles away in the Yukon. This historic railroad, built in the gold rush days of '98 and '99, climbs to an elevation of 2,900 ft. at White Pass, 20 miles out of Skagway, up a 4 percent grade and around 22-deg. curves. En route to Whitehorse, the railroad passes through Carcross, used in early stages of the roadbuilding as a point of supply.

For years business on the railroad had been light, so the roadbed and rolling stock were not kept up to full efficiency. Rail up the steep grade through White Pass is 56 lb., elsewhere it is 45 lb. Ties, 6½ ft. long, are in fairly good shape. The ballast is also adequate, but there are no spring washers in the rail joints, so the track is difficult to maintain under heavy traffic. Bridges are in excellent shape, and will stand heavier engines than are now being used.

As roadbuilding and other materials started to tax the original facilities and organization, the army detailed a railroad detachment to assist in operating the route. Now the railroad is entirely under Army control, although the civilian employees have been retained.

When the Army took over, there were only 12 locomotives on the system, from 4 to 42 years old, weighing from 60 to 120 tons. Of course the first thing the soldiers did was to christen each with a favorite girl's name, including some movie stars. Recently more locomotives have been obtained from an abandoned narrow-gage line of the D. & R.G.W. Railroad in Colorado. Rolling stock consists of box cars (20-ton capacity), flat cars, a miscellaneous assortment of stock, gondola and tank cars, two rotary snowplows and passenger coaches. Maintenance-of-way equipment was limited to hand tools, one pile driver and an A-frame derrick car. Rolling stock has been augmented lately by several new box cars built for some Latin-American railroad, but obtained by the army for the Yukon route.

The railroad formerly used 3 or 4 locomotives to get a freight train up the hill, but the Army is finding it more expedient to keep the train loads down to the capacity of one engine and a pusher, and then to assemble longer trains at the Pass for single engine haul into Whitehorse.

For the Alaska part of the highway, men, materials and supplies went up the west coast to Valdez, southern end of the Richardson Highway to Fairbanks, and were transported by truck to headquarters at Gulkana, 131 miles up this road.

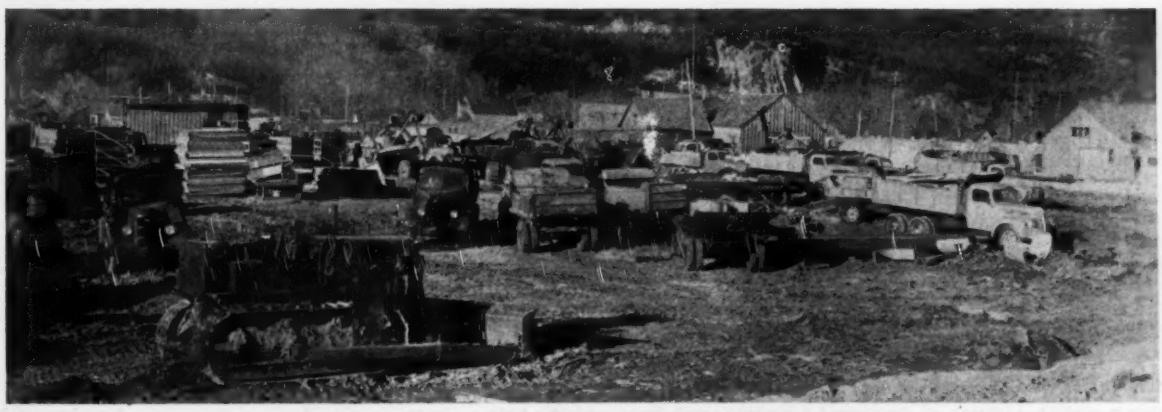
The contract for hauling men, equipment and supplies for PRA and the contractors between the lower west coast ports and Skagway and Valdez, and for distribution over the road, is held by the E. W. Elliott Co., of Seattle. Originally the Army intended to do all of its own hauling up the coast in army transports and army-chartered boats, but as shipping facilities became more and more scarce the Army also depended a lot on the Elliott Co. Larger boats make the run to Valdez, which required leaving the Inside Passage and taking to the open sea, but for the Skagway run a fleet of small yachts transports the men from and to the States. All of the yachts were formerly pleasure

SUPPLIES FOR THE ALCAN HIGHWAY

Temporary oil and gas storage depot at Whitehorse indicates the vast amount of equipment fuel needed to build the road.

Supply trucks plow through mud to reach head-end camps.

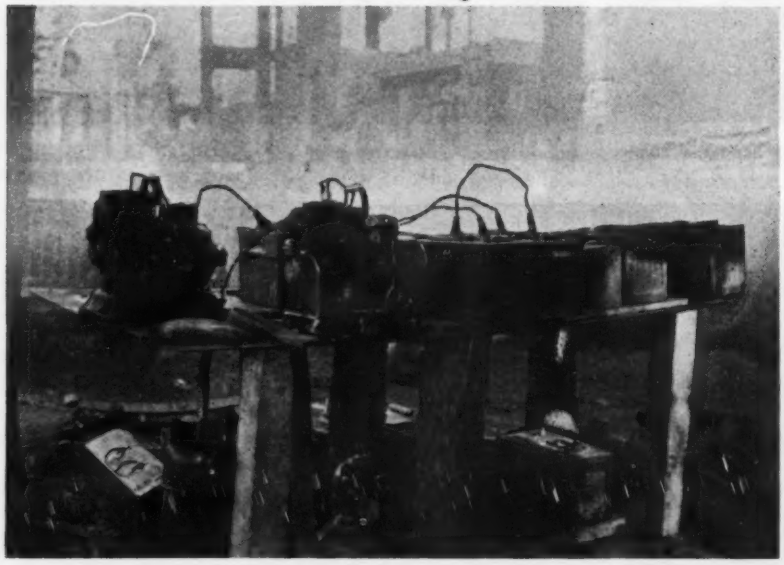
Supply truck comes to grief on road along Muncho Lake.



Equipment and prefabricated buildings on the beach at Skagway, Alaska, waiting shipment over railroad to Whitehorse.

Trailer lubricating unit catches up with a bulldozer out on the road. Much of the construction equipment was serviced by portable refueling, greasing and repair outfits to save time.

Extensive repair facilities were set up by the 340th Engineer regiment at its Watson Lake headquarters by grouping truck-mounted machine shops.



Tiny gas-driven generators charge storage batteries at an army field headquarters repair station. Lighting of equipment for night work increased the battery load.

boats, designed for quiet waters. The construction workers get many a thrill, and doses of seasickness, when the light craft are caught in storms that often sweep up the West Coast. The ferocity of some of these storms is evident from several tragedies, including the sinking of a tug and its barge tow with loss of all hands off Etolin Island. Again, the "Scottish Lady," a towed schooner carrying heavy construction equipment, broke loose from its tug to be wrecked upon the shoals of this same island. Most of the equipment was subsequently salvaged, though damaged by salt-water immersion.

Distribution of supplies

In the van of the engineer troops was a quartermaster detachment, which arrived by rail at Dawson Creek at 1:30 a.m., March 9, under the command of Capt. Elmo Schlei. The temperature was 30 deg. below zero, and the detachment set up tents in a nearby field with the ropes tied to trees and logs as the ground was too frozen for pegs. The troops then scraped the snow out of the tents. As soon as fires were lighted in the stoves, ice on top of the ground, 6 in. thick, started melting, forming a lake inside each tent, which soon steamed up into a perfect Turkish bath. Finally, the soldiers were forced to move to a hillside where there was better drainage but where they were exposed to bitter winds. This outfit paved the way for engineer troops, which began arriving within a day or so.

This quartermaster unit remained at Dawson Creek to requisition, receive, unload, store and issue all army supplies and equipment passing through that supply center. The distribution of supplies over the road and to the various army contingents was handled by regimental supply officers. A few flatbed trailers were available for moving heavy equipment, but most of the shovels, tractors, cranes, scrapers and patrol graders were moved out onto the job under their own power, especially in the early stages when the route was impassable to trailers.

Trucks were used for distributing food, fuel and small supplies whenever the condition of the road permitted, but often sleds and crawler wagons, dragged by tractors, had to be used to reach head-end operations.

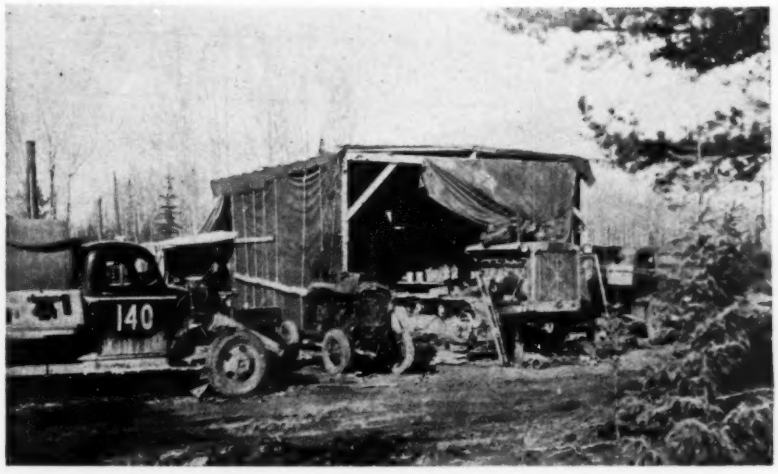
Similar quartermaster detachments

operate for the Army at Skagway, Whitehorse and Valdez.

An emergency shipment of 476 bbl. of fuel oil into Ft. Nelson early in August to the regiment working west from there is an example of how difficult it was formerly to get supplies into that area. The road from Ft. St. John had not yet reached Ft. Nelson, and the isolated regiment was running short of fuel. This shipment was sent by rail to Waterways, Alberta, portaged to Ft. Smith, Northwest Territory, sent by small boat down Slave River to Great Slave Lake, transferred to a larger boat to cross the lake to the MacKenzie River, again unloaded onto a shallow-draft boat for travel down the MacKenzie to the Liard River, then up the Liard to Ft. Nelson River, and up this stream to Ft. Nelson.

The individual contractors requisition supplies through their respective managing contractors, who in turn purchase only with PRA approval under government procurement regulations. Three proposals have to be obtained for all purchases except the very smallest, often a difficult procedure because of slow communication facilities. Warehouses and supply stores are maintained by the managing contractors at base headquarters. Distribution is partly by the Elliott Co. and partly by trucks operated by both the managing and the individual contractors. It is essential constantly to anticipate the multitude of supply needs, but even the best scheduled plans go wrong at times when shipments are delayed.

The biggest headache on the whole project to both contractors and the Army was the lack of spare parts and the difficulty in making repairs to keep the equipment rolling. Not until October did repair parts start to come through; previous to that time the equipment was kept going by ingenious mechanical field work. Fortunately for the Army, most of its equipment was new at the start of the job. However, extremely hard service, continuing day and night, and inexperienced operators took toll of equipment. The Army was forced to train many of its operators right on the job.



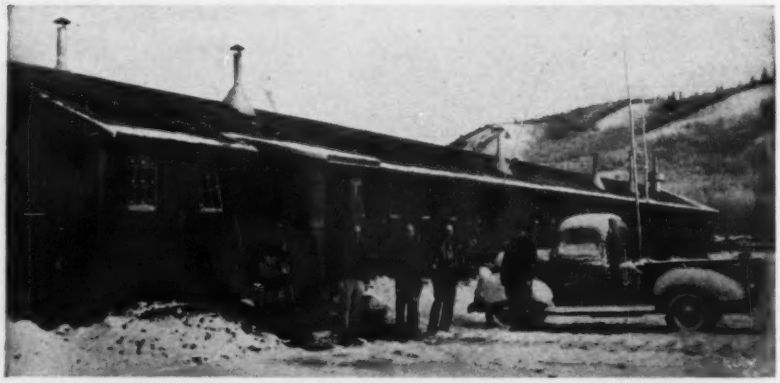
Canvas-inclosed machine shop set up by a contractor south of Ft. Nelson to keep his equipment rolling.

The equipment repair situation was even worse for the contractors, for they had to use old equipment, both their own and that furnished by PRA. From previous experience each of the managing contractors made up an order of standard repair parts certain to be needed. Most of these orders, placed in June, never were filled; delivery on others started trickling through in October. On some standard items, notably tires and wire rope, the contractors were not allowed to make direct purchases because PRA was informed the government would furnish these items from central purchase stocks. Shipment from such stock was delayed until fall, meantime the contractors became desperate. One contractor finally ordered a carload of wire rope on outside purchase to be shipped to Dawson Creek by express. Another, when only 250 tires out of an order of 1,250 finally came through, was forced to put many pieces of equipment on the deadline for lack of rubber. A big shovel and its contingent of 20 trucks and 40 truck drivers were idle for days while a contractor argued with a manufacturer by jammed and inefficient radio over the priority number for supplying a vital shovel part. Considering the tales of grief heard up and down the road it is a wonder the road ever was completed.

Ready for the winter equipment repair program is this big machine shop just completed at Whitehorse by the L. J. Dowell Co. It houses machine tools obtained from an abandoned Yukon mining camp.

Several of the larger equipment manufacturers had representatives on the ground, but their activities finally resolved into teaching new men how to operate equipment, for even factory representatives could not get parts and supplies.

Both contractors and the Army made the best of makeshift equipment repair facilities. At major points, such as Fort St. John, Whitehorse and Gulkana, substantial shop facilities were installed, but elsewhere field repair jobs had to serve. Portable welding and repair outfits went right out on the road and did a lot of minor repair work. When such re-



PRA headquarters camps were substantial and comfortable. This prefabricated building serves as office, mess hall and barracks for the engineers at their Alaska headquarters near Gulkana.

pairs were inadequate and where the field station could not take care of the situation, the equipment had to be transported back to one of the main shops for servicing. Dowell Construction Co. was fortunate in buying the entire machine shop and power plant from an abandoned mine at Mayo, Y. T., which provided excellent repair facilities at Whitehorse.

Living and working conditions

The road was built through long stretches of raw wilderness, far from points of civilization, so naturally living conditions were primitive and working conditions severe. Even the so-called points of civilization were, by most standards, primitive. Dawson Creek, the southern terminus, is a tiny farming hamlet of only 200 or 300 permanent population. Its water supply is a horse-drawn tank wagon, the source is a creek 4½ miles away. Even the Army has to haul water here for there is no groundwater in the tight glacial silt of the whole east slope of the Rockies.

Whitehorse, the only other town on the Alcan Highway proper, has a population of less than 1,000. Its water supply also is team and tank wagon, though the Army, contractors and PRA have developed a shallow well supply for their camps. Fairbanks, of course, is a modern city, but it is 88 miles beyond the end of construction of the highway. Most other named places on the map are merely Indian and trapper trading posts.

The main semi-permanent camps are fairly complete and comfortable. These include such installations as those at Dawson Creek, Fort St. John, Whitehorse and Gulkana. Buildings, for the most part, are of prefabricated new units of insulated plywood, or CCC demountable buildings shipped in from the States, or Nissen steel semi-cylindrical insulated huts. All of these main camps have running water and sewers (except Dawson Creek), and electric power and lights. Some of the contractor and army barracks at Whitehorse are built of lumber shipped in from Seattle.

Out on the road the camps are much more simple. During the fast-moving construction stages the camps were framed tents, with field kitchens housed under canvas. They were frequently moved, so it was not possible to make them very comfortable. However, in most instances, electric lights were available from portable generating sets. One enterprising group of officers rigged up a portable welding machine as a light plant.

Several contractors, especially the Alaska group, discarded tents in favor of small shacks mounted on log skids. Moving day saw a fleet of cabins dragged down the road by tractors, trucks and even by patrol graders.

Of course, water supply dictated the location of even the most temporary of camps. Usually the streams and lakes were a potable source of water, but whenever any doubt existed as to possible pollution the water supply was chlorinated with portable units. A detachment of Public Health Service officers assisted the Army medical officers in maintaining health regulations.

Just as fast as construction units, both Army and contractor, could be spared from road operations they were assigned to building the permanent rest camps for housing the truck operators and road and equipment maintenance crews. These camps are of varied construction. Some of them are old CCC buildings, others are prefabricated units or Nissen huts, but many of them are built of local lumber produced by roadside sawmills that earlier in the program turned out bridge timbers. These camps are all equipped with running water and lights. They are heated mainly with oil burning heaters, as also are the main camps.

On the road the Army officers and soldiers are all supplied with comfortable sleeping bags, blankets and folding cots. The regular pyramid army field tents are used, each equipped with a small wood-burning stove. If the men put a little effort into properly setting up the camps they can be made fairly comfortable. Soldiers at these camps, each supplied with a field mess kit, are fed in the open from field kitchens. Most of the time the officers eat in a mess tent.

The contractors usually set up large tents or buildings for kitchens and mess halls. They also prefer bunkhouses or dormitory tents where possible instead of the smaller units. PRA engineers always have good camps, even on the trail. They are often demountable prefabricated wood units, though, of course, the surveyors out on the line had to live in tents. Contractors and PRA furnish cots with mattresses and blankets whenever possible in preference to sleeping bags.

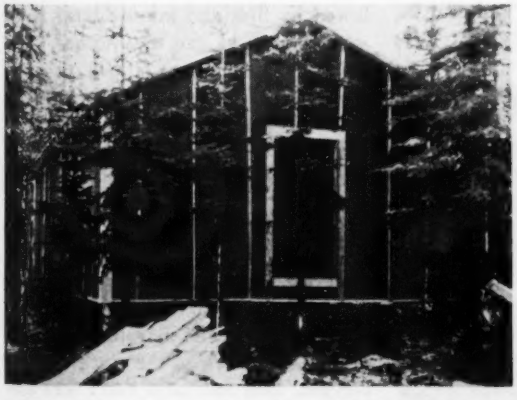
The food supplied by all three organizations is of good quality, wholesome and in sufficient quantity. Exceptions, of course, occur when supply lines break down or small detachments are called upon to feed persons outside their own unit. Travel up and down the line is continuous, and the rule of the road calls for feeding whomever is present at meal time, regardless of affiliation.

The army food supplied to field units is largely field rations, designed primarily to sustain soldiers in combat. In normal combat operations the units are usually in front lines for short periods, and get a change of diet when relieved. On the highway, however, the men are in the field constantly, week after week, so the canned field rations become monotonous. The Army supplements these rations with fresh meats and vegetables to some extent, and this situation improved as the various sections of the road became stabilized to permit scheduled truck operations.

CAMPS ALONG THE ALCAN HIGHWAY

Preparation of a new army camp site and serving mess proceed together in a British Columbia spruce forest. Moving camps every few days to keep up with road building was a considerable job in itself.

Camps at the head end of pioneer roadbuilding operations were primitive. Here is an outdoor kitchen serving negro troops in the Yukon. The G. I. stove never reached this outfit so they use open fires and an oil-barrel oven.



Substantial rest camps have been established from 45 to 90 miles apart to house truck drivers, equipment service and repair men, and snow-removal and road maintenance crews. This army bunkhouse, built from lumber sawed on the site near the Tanana River is typical of the winterized buildings.

Portable generating sets made it possible for even the smallest of camps to have electric lights, one comfort in otherwise primitive accommodations.

Frankly, PRA and the contractors feed better, probably not a better quality of food, but more variety and a greater proportion of fresh products. They put meat refrigerator trucks into service as soon as possible. The Army has refrigerator storage units at the main points of supply, but facilities for storing fresh meats in the field are limited.

The government promised to furnish much of the kitchen and camp equipment needed by the contractors from CCC camps in the States. Delays in shipping these supplies caused some inconvenience at first, especially in Alaska where workmen arrived ahead of camp equipment. Some trouble was also experienced from coal-burning cook stoves delivered from CCC camps to a project devoid of coal. There was plenty of oil and wood on hand, so the stoves simply had to be converted to other fuel.

Sometimes the camp fare was blessed with fresh game, especially moose and game birds. One outfit working at the head end had to depend on game for a while when the supply line failed, so long in fact that the boys complained of the monotony.

Most of the contractors worked two 11-hour shifts a day, seven days a week, though a few operated on 10-hr. shifts. Regardless of whether the men worked 70 or 77 hours a week, very little overtime was paid. Hourly rates ran from a minimum of 96½ c. for laborers to $2 for shovel, dragline and crane operators. Tractor drivers got $1.60, scraper operators $1.70. Truck drivers were paid from $1.10 to $1.40. The men were charged from $1.50 to $2 per day for room and board, depending upon the individual camps.

Civilians working for contractors received transportation from the States and return if they stayed the length of the job or until released. If discharged for cause or if they quit before being released, they had to pay their own way back. Paying for the return trip wasn't nearly so hard sometimes as finding means of transportation. The supply of men for the most part was satisfactory, although at times contractors lacked certain classes of workmen. Both the Canadian and American firms are restricted to hiring workmen from their own country.

Morale of the troops and the contractors' employees was, and still is, excellent in view of the living conditions. The contractors' men knew they would return home when the season's work was done (most of those staying this winter are doing so voluntarily). The officers and soldiers, on the other hand, knew they were stuck for a long time. Rumors of furloughs swept through the bush by "moccasin telegraph". Uncertainty of furlough was the greatest single item in breaking down morale. The army has now announced furloughs will be granted to all men possible this winter, contingent upon the physical difficulties of transportation over the vast distances between the project and home.

Difficulties in getting mail through added to the morale problem. Sometimes letters from home were delayed three to six weeks. Lack of world news was another disappointing feature. Radio reception, especially through the Yukon and Alaska, is poor because of climate and topographical conditions, so the boys out on the line were really out of touch with the world for days and days.

Mosquitoes were bad on some parts of the line, were singularly absent on others. Those who were plagued the worst were men deep in the woods, the surveyors, locaters and the lead construction crews. These pests lasted from two to six weeks, the length of time varying greatly in different sections. In some cases they were followed by flies and minute bugs, just as annoying as the mosquitoes.

Entertainment was simply non-existent. There was no recreational program provided for soldiers or civilians, probably none could have been provided. Work, work and more work was the only program—day and night, seven days a week. Reading material was scarce, so outside of working hours life became a bore to many of the boys.

Yet, after all, the morale must have been high in view of the work accomplished. Men and boys can't feel too discouraged and still build nearly 1,800 miles of road in one short season. The spirit was there, even if living did become primitive and monotonous.

The third and final article in this series, to be published January 14, will tell of the actual construction operations, how the army filtered the various regiments into the project and attacked the work, how the contractors operated, and how the bridge and drainage problems were solved.

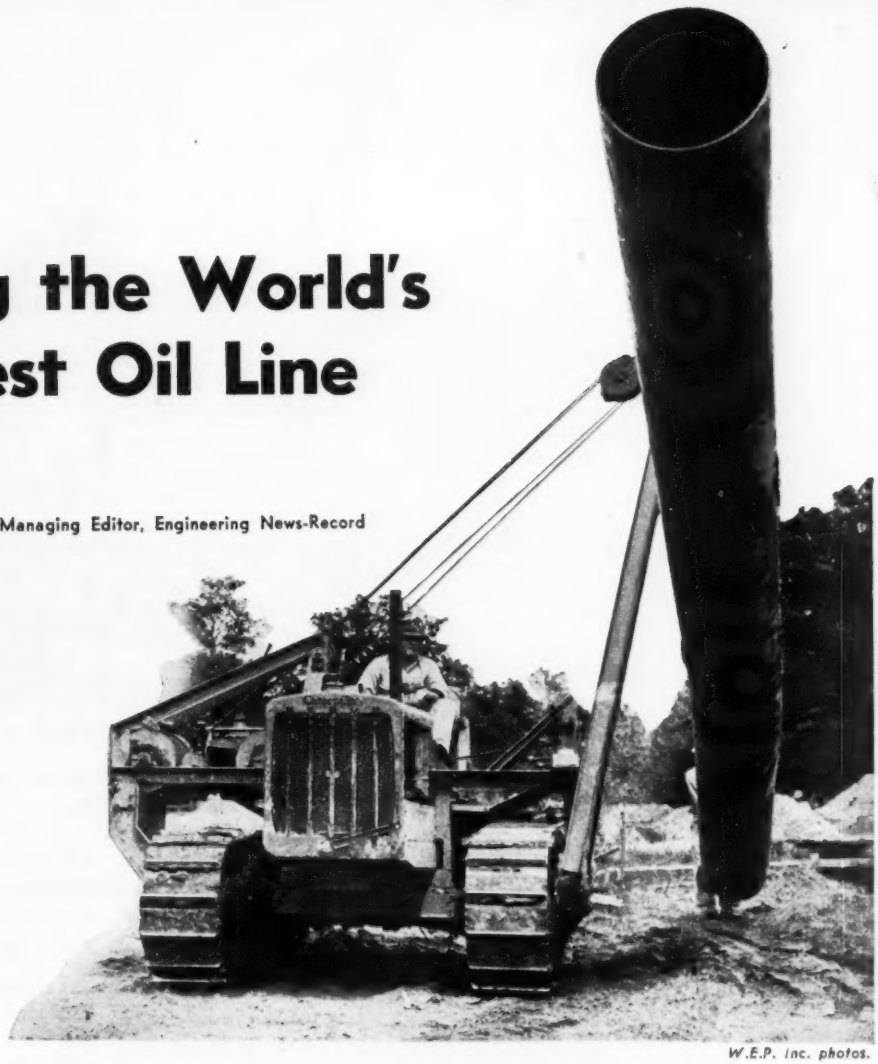
BEATING THE SUN

Lytle & Green's contractors found the bridges on the Richardson Highway between Valdez and Gulkana too light for the big tractors and scrapers, so they had to ford the streams. They found that 4 to 9 a.m. the best time for crossing, for the streams rose rapidly in the late morning as the sun warmed up their glacier sources. By midnight the congealed glaciers choked down the flow, only to spout freely again when the sun went to work the next morning.

Camp water supplies are well protected. Where water sources are subject to pollution the supply is treated by portable chlorinators and treated water stored in canvas tanks as shown here.

Building the World's Biggest Oil Line

Edward J. Cleary, Managing Editor, Engineering News-Record



W.E.P. Inc. photos.

***Contents in Brief**—Most spectacular of all pipeline jobs is the War Emergency Pipelines, Inc. project now being built from the Texas oil fields to refineries on the Atlantic seaboard. With a main line length of 1,250 miles and a diameter of 24 in., it ranks as the largest pipeline ever designed to carry crude oil. Thirteen contractors are installing the pipe, the first 500 miles of which will be in operation in February.*

WHEN A MAN INTERRUPTS his conversation to answer a long distance call by saying "Okay. Put in an order for 360 miles more of pipe, delivery to start as soon as possible," and then calmly turns back to the point he was discussing, you can't escape the feeling that he is doing big things and doing them fast.

This was the setting in which an *Engineering News-Record* editor found himself one day late in October, when word was flashed to the War Emergency Pipelines, Inc. office at Little Rock that authorization had been given by Washington to extend the world's largest crude oil line to the Eastern seaboard. That simple telephone order given by B. E. Hull, general manager of War Emergency Pipelines, Inc., did more to dramatize the speed and efficiency with which one of this country's most spectacular war projects is being pushed, than did anything else seen or heard on the job.

And the job is packed with action. Starting on August 1, seven experienced pipeline contractors with a total crew of 4,000 men, began installation of a 24-in. diameter line from the oil fields at Longview, Tex., to a rail shipping center at Norris City, Ill. Working at different points along the 530-mile line, the contractors were putting in pipe at the rate of 6 miles a day. It has been pointed out that "probably no construction project has ever been carried on at the same time between latitudes so far apart and covering such a variety of climate and terrain," as encompassed by this job.

Today that statement bears even greater emphasis. On October 28, the War Producion Board authorized extension of the pipeline from Norris City to Phoenixville, Pa., where branch lines will be laid to the Philadelphia and New York refinery areas. Thirteen contractors are now engaged in pipe installation. The length of the main line will be 1,250 miles, and it will have a capacity of 300,000 bbl. daily (12,600,000 gal.)

Heretofore, several large diameter natural gas pipelines of lighter weight have been constructed. But the Texas-New York pipeline can lay claim to being the longest crude oil

To meet changes in alignment, both horizontal and vertical, the pipe is bent to fit as required. Above is shown the method of making a hot bend using a jig along with block and tackle and hand winch.

line with the largest diameter and weight per linear foot ever designed. Nearest competitors are believed to be two smaller diameter lines, each about 900 miles long, from Iran to Mediterranean ports, and a relatively short line in Venezuela at about 16 in. diameter.

Purpose of the pipeline is to bring to the East a supply of oil that cannot now be obtained because of tanker shortages and lack of sufficient railroad tank car facilities. Even with present unprecedented tank car shipments of more than 850,000 bbl. daily, the needs for oil cannot be satisfied. Some relief to the situation should be provided in February when the first section of the pipeline is expected to be in operation to Norris City. But the entire line will not be completed until next June.

Know-how and money

Design and supervision of the pipeline is being carried out by the War Emergency Pipelines, Inc., a corporation capitalized at only $11,000, organized and owned by the eleven oil companies who market most of the products consumed in Eastern States (see box for names). The corporation acts as the agent for the Defense Plant Corporation, an RFC-sponsored organization that advances federal funds for the construction of industrial facilities required in the war effort. Total cost of the pipeline, with appurtenant pumping and storage facilities, is estimated to be $95,000,000.

The position of the oil companies acting in this enterprise is simply that of supplying the "know-how" and experienced personnel to do the job. The calibre of the men selected by the oil industry for this important task is personified by B. E. Hull, vice-president and general manager. A veteran of 38 years experience, he began as a party-chief on pipeline location work from Oklahoma to the Gulf Coast shortly after graduating from Texas A & M in 1904. Today, as president of the Texas, Texas-Empire, Texas-New Mexico and Kaw pipeline companies, he has taken leave temporarily from these responsibilities to manage the biggest job of its kind.

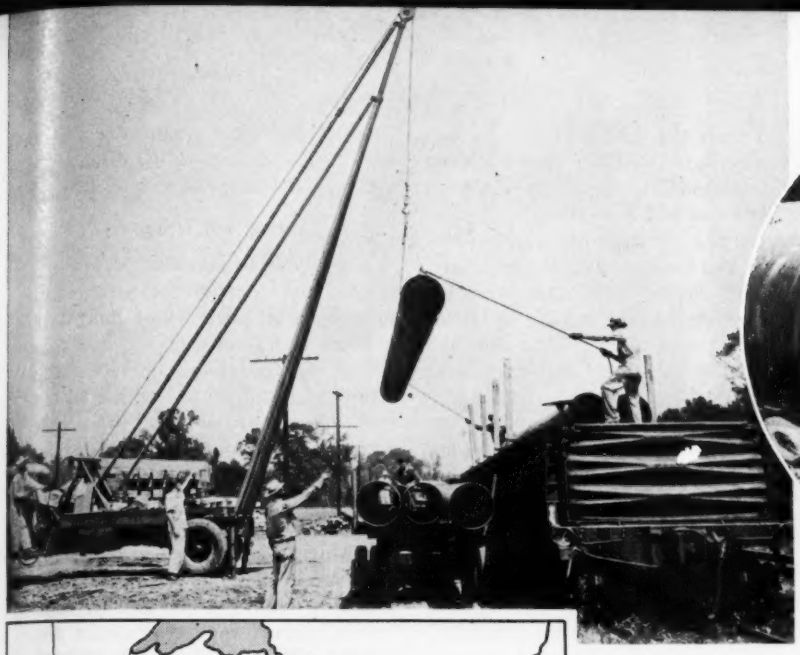
PARTICIPATING OIL COMPANIES

- Atlantic Refining Company
- Cities Service Company
- Consolidated Oil Company
- Gulf Oil Corporation
- Pan-American Petroleum and Transportation Company
- Shell Oil Company
- Socony-Vacuum Oil Company
- Standard Oil Company of New Jersey
- Sun Oil Company
- Texas Oil Company
- Tidewater Associated Oil Company

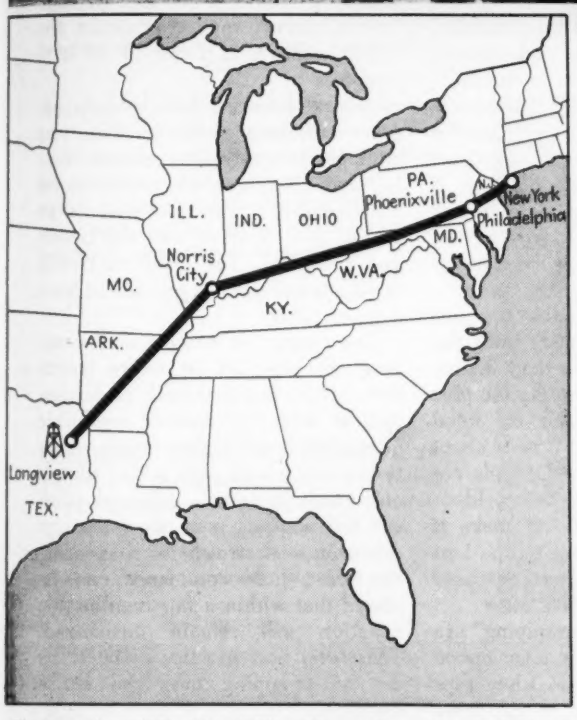
Contractors win praise

Frequently in our conversation Mr. Hull spoke with admiration of the job being done by the men in the field. He left no doubt that the conception and organization of the project was only part of the story. Having spent many years in the field himself, he has a sympathetic appreciation of he role being played by the contractors who are laying pipe at a rate averaging 6 miles a day. They, too, are establishing records. Never before have they had to handle pipe of such size and weight as is being used in this "big inch" line. (In the jargon of the oil fields, any pipe over 10 in. dia., is known as "big inch").

As stated previously, it is the size of the pipe as well as the length that lends distinction to this project. With a thickness of $\frac{3}{8}$ in., the sections of pipe average 38 to 44 ft. in length and weigh 3,800 lb. to 4,200 lb. Consequently the largest types of side-boom tractors are needed to pick up the sections and to support the pipe during wrapping and lowering operations. And these machines must be equipped with heavy counterweights on the off-boom side to prevent overturning.



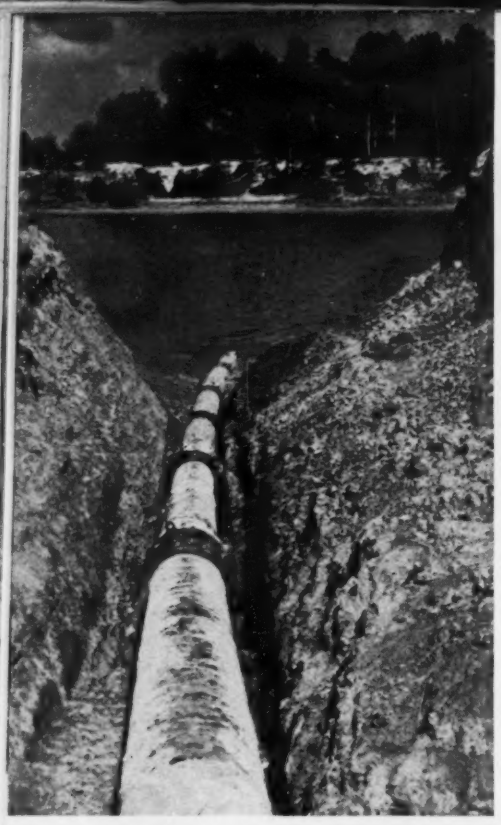
Shipped from the mill to rail points close to the line, pipe is loaded on trailer trucks that "string" it where needed. Inset shows how interior of the pipe is swabbed clean.



First section of the line (530 mi.) goes from the oil fields at Longview, Tex., to Norris City, Ill. The second section stretches across 720 mi. to Philadelphia and New York.

After the ends of pipe are brought together with clamps and tack-welded, another crew performs a three-pass welding operation to complete the connection. Inset shows a finished weld identified with the welder's mark so as to fix responsibility.

Welded together and bent to fit the contour of the ground, the pipeline is ready to receive its protective wrapping. The horizontal kinks in the line are made purposely to provide for expansion and contraction due to temperature changes.



At stream crossing the pipe is weighted with "river clamps" spaced at 34-ft. intervals. Below is a close-up of the clamp, which is a 4,800-lb. cast iron split sleeve.

The pipe itself is 24 in. O.D. seamless steel weighing 94.62 lb. per foot. Some 135,700 tons of steel (Grade B, American Petroleum Institute specifications) are required for the first portion of the line, and 225,000 tons for the second.

As an example of the well-organized operations of the construction contractors, they had handled (at the time this was written) 4,000 carloads of pipe at 60 different locations without incurring any demurrage penalties.

To see the field operations a trip was made to the 66-mile section being constructed by Anderson Brothers, "somewhere in Arkansas."

Here a 50-ft. wide right-of-way strip had been cleared of timber and brush. Near the left hand edge a wheel-type ditching machine was cutting a trench 42 in. in width and about 3½ ft. deep. Soil conditions were ideal at this point and the machine cut a firm trench in clay-loam material at the rate of 12 ft. per minute.

Further back, however, the going had been tough—here the trench traversed a granite ridge that had to be blasted every three feet with a 3-stick charge of dynamite.

Simultaneously with the trenching, and sometimes ahead of it, lengths of pipe were being brought in on trailer trucks and gently laid end-to-end. Contrary to the practice with smaller diameter pipe, which is sometimes rolled off the truck, the big pipe is picked up with a side-boom tractor in order that the ends will not be damaged and thus open the way for a bad joint.

Further back on the line the pipe was being welded together, using the so-called "stovepipe" method. Essentially, this consists of laying the pipe directly over the trench on wood timber cribbing so that it rests about 2 ft. above ground level. Ends are brought together and tack-welded; welding crews follow and make a three-bead weld to complete the butt joint. Electric welding is used throughout the project.

In contrast to "stovepiping" (a term that is a hangover from operations 12 to 15 years ago when pipe was flared on the end to slip over adjoining pipe in a manner similar to stovepipe installations), there is the "roll weld" method. Half of the contractors are using this procedure. It consists of welding three or four joints of pipe in a section, after which the entire section is rolled over and added to the line.

To meet changes in alignment, both horizontal and vertical, the pipe is bent to fit as required. Both hot and cold bending is used, depending on the length and magnitude of the required curvature. One or two tractors are required to make the bend, aided in this effort by the use of a bending jig and a block and tackle rig. When there is difficulty in bending the pipe cold (particularly in winter weather) the pipe is heated with large blow torches to a cherry red temperature.

Coating and wrapping

After completion, field welds are cleaned by hand with a wire brush to remove all particles of flux; this is done to minimize pitting and corrosion. Following this operation the pipe is cleaned, primed with coal tar enamel and wrapped to protect it from soil corrosion and electrolysis.

Cleaning and priming are accomplished with a special machine that is attached to the outside of the pipe and which is self-propelled by means of a gasoline-engine. Equipped with revolving steel brushes that precede the tar enamel applicator swabs, the machine moves at a rate of 40 ft. a minute.

Several hundred feet behind, another machine follows, this one equipped to apply a tar enamel coating and a spiral-wound wrapping of asbestos felt. After the pipe is so treated it is lowered into the trench and backfilled. The depth of trench is always sufficient to provide at least 2 ft. of cover.

The reason for coating and wrapping the pipe for its entire length rests in the fact that such protection against corrosion assures negligible depreciation and higher future valuation as compared with a line that is only partly protected. Although present soil analysis may show that no deleterious electro-chemical properties exist, little confidence can be placed that within a few months this situation will remain unchanged. Therefore, best practice dictates the use of wrapping over the entire length.

River crossings are special

River crossings are considered a specialty operation, and for that reason the 8 major crossings on the first section have been awarded on a single contract to Williams Brothers Corp. of Tulsa. Special equipment, such as dredges, hoists and pulley winches are required, which are not ordinarily used on pipeline work through open country.

Further, a crew of only about 50 men are required for a river crossing as compared with a normal "spread" of 500 men. Hence both time and money are saved when a contractor is not required to stop a straight run while a crossing is being made.

Before the welded pipe is lowered in the trench it must be protected from soil corrosion and electrolysis. First step is cleaning and priming, accomplished with a self-propelled machine equipped with wire brushes and a coal-tar enamel applicator.

After the pipe has been primed, another machine follows by means of which a hot-tar enamel and a spiral-wound wrapping of asbestos-felt is applied in continuous strips.

Making a final test to insure that there are no "pinholes" in the protective wrapping that would permit exposure of the steel pipe. High-voltage current is fed to a coiled spring that encircles and touches the pipe; sparking occurs at points where the insulated wrapping is incomplete.

Completely wrapped for protection, the pipeline is gently lowered into the trench. For this purpose three side-boom tractors, spaced about 50 ft., are used to ease the movement of the flexible pipeline; wide rubber slings prevent abrasion of the wrapping.

Because the pipe is buoyant when empty, it is necessary to weight the sections in a stream with "river clamps." These are split, cast iron sleeves weighing about 4,800 lb. On small crossings two to four sleeves will be attached; on wide rivers the sleeves are placed at 34 ft. intervals.

Pumping stations and tanks

Along the 531-mi. stretch from Longview to Norris City there will be eleven pumping stations. Each station has a capacity of 300,000 bbl. a day, and will maintain a pressure of 750 lb. per sq.in. For this purpose the stations are provided with 3 centrifugal pumps, each direct connected to a 1,500 hp. electric motor.

There will be fifteen additional pumping stations on the second leg of the line, from Norris City to Phoenixville, Pa.

At Norris City facilities consisting of 15 steel tanks, each with a capacity of 80,000 bbl., some 10 miles of railway tracks, and tank car loading racks capable of loading 1,000 cars daily, are being erected. All of the tanks were purchased second-hand in various parts of the country, and are being dismantled for shipment.

Without question, the War Emergency Pipelines, Inc., project is the most spectacular of all pipeline jobs. But aside from this obvious fact there are other features of the undertaking that claim attention.

First, it presents the example of eleven companies in the oil industry pooling their best talent in a joint enterprise with the federal government toward a single objective.

Darling Valve & Mfg. Co. Photo

Main line gate valve, which has a 4-in. wall thickness and weighs 8 tons, will control oil moving at 750 lb. pressure.

And second, procedures have been adopted whereby construction operations can be instituted quickly and pushed aggressively. All contracts were expedited through the use of negotiated bids, and WEP Inc. reserved the right to take over the equipment and complete the work of any contractor who fails in his obligations.

There is no question in the mind of General Manager Hull that the contractors have and will continue to put forth their best efforts. Said he, "Almost three-quarters of the oil industry is directly interested in this pipeline. If any contractor falls down on this job, it won't be forgotten when future pipelines are to be built. But present performance indicates that no fears need arise about the role that the construction men are playing."

Who's who on the project

For the Defense Plant Corporation, Charles P. Cathers is in charge of engineering operations on the pipeline.

Engineering and supervisory activities for the War Emergency Pipelines, Inc. are directed by B. E. Hull, vice-president and general manager, assisted by A. N. Horne, vice president and general superintendent, Oscar Wolfe, chief engineer and O. R. Burden, assistant general superintendent.

Messrs. L. M. Goldsmith of Atlantic Pipe Line Co., W. R. Finney of the Standard Oil Co. of N. J. and C. H. Kountze of the Sinclair Refining Co. are the members of an advisory engineering committee. W. Alton Jones, president of Cities Service Co., is serving as president of War Emergency Pipelines, Inc.

CONTRACTORS BUILDING THE WORLD'S LARGEST OIL PIPELINE

Pipeline Construction

Anderson Brothers, Little Rock, Ark.	190 mi.
W. A. Bechtel Co., San Francisco, Cal.	65 mi.
O. E. Dempsey Const. Co., Tulsa, Okla.	166 mi.
Exeter Construction Corp., Camp Hill, Penna.	41 mi.
Chas. S. Foreman Co., Kansas City, Mo.	135 mi.
I. C. Little, Dallas, Texas	44 mi.
Jones & Brooks, Oklahoma City, Okla.	37 mi.
Midwest Engineering & Construction Co., Tulsa, Okla.	45 mi.
Oklahoma Contracting Co., Dallas, Tex.	313 mi.
Sheehan Pipeline Const. Co., Tulsa, Okla.	112 mi.
Ray L. Smith Const. Co., Eldorado, Kan.	96 mi.
O. C. Whitaker, Fort Worth, Texas	44 mi.
Williams Bros. Corp., Tulsa, Okla.	160 mi.

Major River Crossings

Williams Bros. Corp., Tulsa, Okla.
Chas. S. Foreman Co., Kansas City, Mo.

Pumping Stations (east of Norris City, Ill.)

Contracts not yet awarded

Pumping Stations (First portion of line)

Williams Bros. Corp., Tulsa, Okla
Sheehan Pipeline Const. Co., Tulsa, Okla.
Midwest Engineering & Const. Co., Tulsa, Okla.

Storage Tanks

Graver Tank & Mfg. Co., East Chicago, Ind.
Pittsburgh-Des Moines Bridge & Iron Co., Pittsburgh, Pa.
Steel Tank Const. Co., Dallas, Tex.

Field Surveys

Huey & Cage, Monroe, La.	620 mi.
Lockwood, Kessler & Bartlett, Brooklyn, N. Y.	461 mi.
Midwest Engineering & Construction Co., Tulsa, Okla.	330 mi.

Pipe Manufacturers

National Tube Co., Pittsburgh, Pa.
A. O. Smith Corp., Milwaukee, Wis.
Republic Steel Co., Youngstown, Ohio
Youngstown Sheet & Tube Co., Youngstown, Ohio
Jones & Laughlin Steel Co., Pittsburgh, Pa.

Soil-Cement Pavement for Desert Airbase

***Contents in Brief**—Outlined are the step-by-step methods of soil-cement paving and laboratory and inspection control followed in building a desert Army airbase in a hurry. A total of 750,000 sq. yd. of paving was laid in 49 days with 35,011 sq. yd. built in one 18-hr. period. The machinery employed was secured from many sources and included pulverizers and other agricultural tools, highway equipment, and cement trucks from the oil-well industry; little special equipment was used.*

To "KEEP 'EM FLYING" will be possible if all airbases are built as quickly as one recently completed by the U. S. Engineers on a desert area of sand dunes, mesquite, yucca and cactus. Construction of 750,000 sq. yd. of 6-in. thick soil-cement pavement for runways, taxiways and parking aprons required but 49 days. Processing started May 24, and was completed July 11, 49 days later. No processing was done seven days, and the average for the 42 remaining days was 17,840 sq. yd. In the 13-day period from June 20 to July 3, processing averaged 24,000 sq. yd. daily; the largest one-day's production was July 3, when 35,011 sq. yd. were processed. On this day spreading started at 1:15 a.m. and the final rolling was completed at 8:00 p.m.

Preparation of the site

The airbase site was typically desert, with sand dunes 2 to 4 ft. high formed by drifts at the clumps of mesquite bushes, yucca, and cacti that dotted the area. The leveling of the dunes with bull-dozers and scrapers was the first job, followed by combing out and hauling away the mesquite and cactus brush and roots.

As the area to be paved was brought to grade, it was scarified and watered, rolled with sheepsfoot and pneumatic rollers, and smoothed by blading. Fill sections were placed in 6-in. lifts, watered and then rolled with the sheepsfoot rollers. In cut sections water and compaction were transmitted to the subgrade beginning 6 in. below grade by scarifying, watering, and rolling of the top 6 in. It was required that field compaction be not less than 95 percent of that obtained by the Proctor compaction method in the laboratory.

The soil to be processed was a loamy fine sand, classified A-2 by Public Road Administration's standards. It had 2 percent of gravel above the 2.0-mm. size, 82 percent sand of 2.0 to 0.05 mm. diameter and 16 percent silt and clay below the 0.05-mm. size. The liquid limit was 19, the plasticity index 3, and the lineal shrinkage index 3. A laboratory study indicated that 10 percent Portland Cement by volume could be used satisfactorily to harden the soil. Preliminary moisture density relation curves indicated a maximum density of 121 lb. per cu. ft. and an optimum moisture content of 11 percent.

The evening before the processing of an area was started the top 6 in. was scarified and watered uniformly to increase the moisture content to about 6 or 8 percent, so that later the necessary water to produce optimum moisture in the mixture could be added with one pass of the water truck and mixing machine. This scarifying and pre-wetting softened and broke up the dry, crusted material. The scarifying also aided in obtaining the proper pulverization and uniformity in the soil-cement mixture. The surface next was smoothed with a blade and lightly rolled with pneumatic rollers to permit easier travel by equipment.

Fig. 1. At start of operations site, was typical desert with sand dunes 2 to 4 ft. high at the clumps of mesquite, yucca, and cacti that dotted area.

General plan of construction was to start along one edge of a selected area and work across it in parallel lanes 7.2-ft. wide; this width of lane was established by the effective width of the equipment employed. All equipment moved along the lane being processed as a train, one piece following another to complete much of the work in one pass. After the train of equipment traversed the 2,000 to 2,500 ft. selected as the most satisfactory length of lane, it turned around and entered an adjacent lane for the return trip. By careful attention to original grade and finishing procedure, it was possible to obtain satisfactory grade without the use of forms. The several processes of soil cement paving were carried on successively throughout the day with as little time as possible allowed for drying out between the various steps. All machines worked simultaneously, but operations are described separately in chronological order.

Soil-cement processing

Spreading the cement—Bulk cement from a local mill shipped to the site by railroad was used. A loading platform giving access to three cars at once was constructed at the car floor level and built wide enough to bridge an excavated pit-roadway, which permitted the cement trucks to pass under the platform for gravity loading. In the platform floor were three metal funnels used to feed as many hatches in the top of the 600-bag distribution trucks, which were formerly employed in oil well cementing activities. Cement was delivered to the funnels by buggies and wheel barrows and a 600-sack truck could

Fig. 2. Required cement is added at the uniform rate of 42.3 lb. per sq. yd. by rubber-tired spreaders operating behind a 600-bag bulk cement truck.

Fig. 3. To guide the operators of the equipment following the cement spreader, a furrow is prepared each side of the lane to which cement has been added.

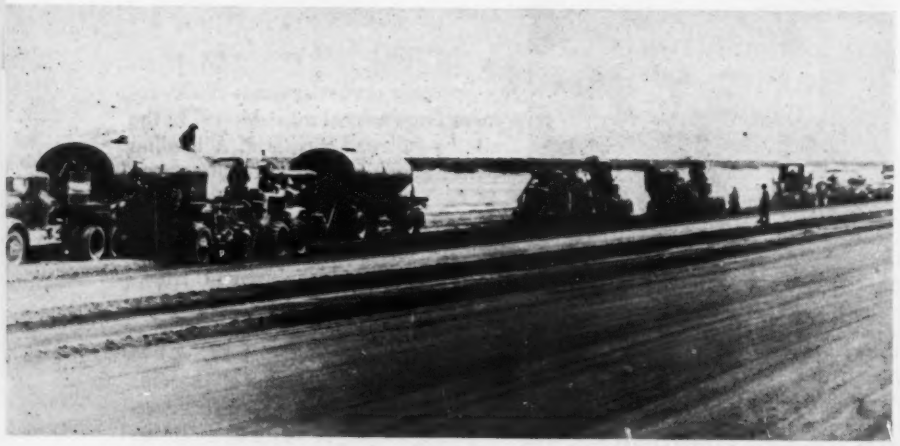


Fig. 4. At the left a mixer pulled by a tractor is applying water to the lane being paved and mixing the materials. The machine is followed by another mixer and a patrol grader and sheepsfoot rollers.

be loaded in 20 min. A crew of 10 laborers was used; 20 workmen loaded one truck and then rested while the rest of the crew loaded the next.

Cement spreading operations usually began about 1:00 a.m. This early start permitted cooler working conditions for the loading crews, and provided the necessary head start in the cement spreading work; mixing operations began shortly after daylight. The cement spreader was a two-wheeled detachable unit that hooked on the back of either of the two supply trucks employed. Cement from the truck was delivered to the spreader hopper by augers in two 12-in. tubes that ran full length of the truck, one on each side at the bottom. The spreader consisted of a 10-cu. ft. hopper with a fluted batching cylinder at the bottom that discharged 205 lb. of cement per revolution. By means of a special gear box the speed of revolution of this cylinder could be set to produce a constant rate of rotation per foot of travel, regardless of the speed of the truck. Accuracy was within one percent of the quantities required.

The cement was spread in a continuous 3-ft. wide ribbon at the center of the 7.2-ft. wide lane being processed. Line stakes every 100 ft. assured straight spreads. As the spreader approached each line stake, the stake was removed and set over the length of a 7.2-ft. long measuring stick. This latter work provided a row of stakes for the next lane.

Plowing the Guide Furrows—The mid-points between adjacent cement spreads marked the plow line. A guide furrow 6 in. deep was added at those points to mark the edges of the process lanes and to make the remaining operations easier. The plow was of the "middle buster" type built locally by welding together left and right-throw plows. To assure accuracy as to required depth and line, the plow was attached to the scarifying attachment bar of a motor patrol.

Dry Mixing Material—Three mixing machines all of similar design and of the "road-mix" type were used in the dry and moist mixing operation. Traveling in tandem the three units mixed soil, cement, and water, ready for compaction, at the rate of about 4,000 sq.yd. per hour of traveling time. The chassis of each machine, including motive power,

was regular No. 12 motor patrol. In place of the blade there was a mixing unit controlled similar to the raising, lowering, and tilting of a blade. The unit consisted of a metal hood and two mixing spools or cylindrical cages to which were bolted numerous 6x8-in. steel paddles or knives, arranged spirally on the surface of the cage. The spools were powered by a separate diesel motor mounted near the front of the machine.

In operation, the forward motion of the machine bladed the soil loose to the desired depth by means of a cutting edge across the bottom of the mixing hood. Next the soil was forced against the front revolving spool, which threw it over the top, where it was caught by the rear spool and thrown to the ground in a windrow.

In the sandy material encountered sufficient dry mixing was secured with one pass of a mixing machine traveling about 80 ft. per minute. The maximum width of cut possible was slightly under 7½ ft. The machine could either cut the soil up from the undisturbed grade, if it was not too hard, or pick up and mix a previously formed windrow. Thoroughness of pulverization and mix were watched by digging through the windrow, and remedied, if necessary, by slower travel of the machine, or by additional trips over the windrow. The mix had to be such that no streaks of raw soil or unmixed cement were visible.

Water Addition—The addition of the water necessary to bring the soil-cement mixture to optimum moisture content or that condition at which maximum density was obtained during rolling was the work of the second mixing machine. The water was injected into the mix through a slot just behind and above the cutting edge that loosened the soil from the subgrade. Water was supplied to the mixer by one of two 5,000-gal. supply tanks; one tank was loaded while the other followed along beside the mixer and added the water through a large hose connection. A maximum addition of about 4 gal. of water per ft. of travel, or the equivalent of an 8 percent moisture was added to the windrow when the pump operated at capacity and the mixer traveled as slowly as possible. By synchronizing the readings of the water meter and the tachometer measuring speed of forward travel, the water added per

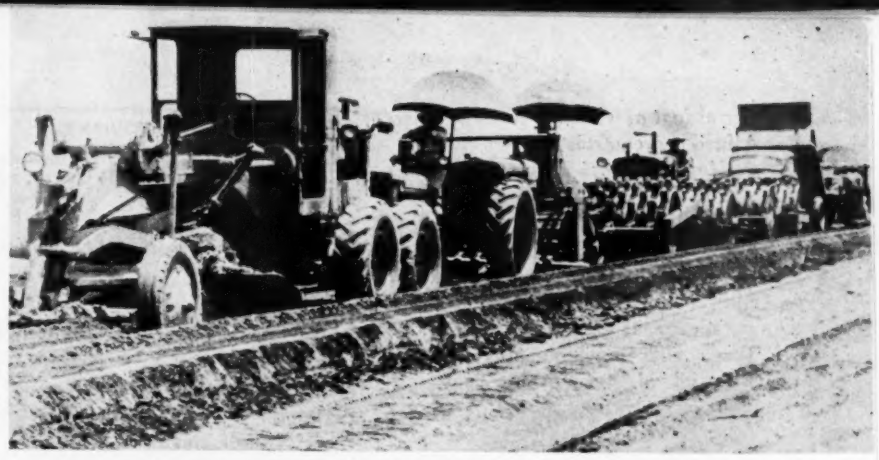


Fig. 5. Close-up of patrol grader, sheepsfoot rollers, and other equipment that follows closely behind the mixers.

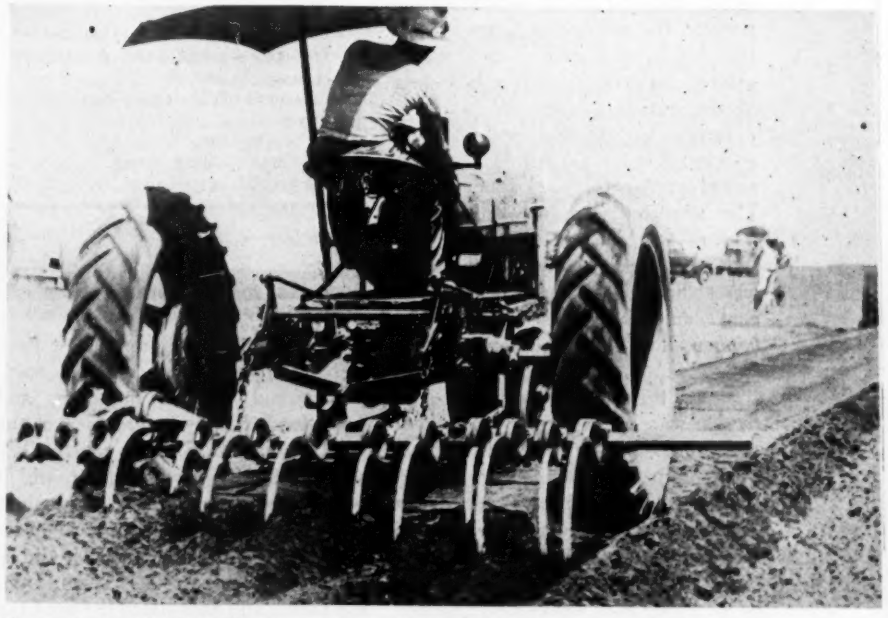


Fig. 6. Spring-shank cultivator follows motor patrol grader to scarify tracks of grader. Cultivator is one of several farm tools used on job.

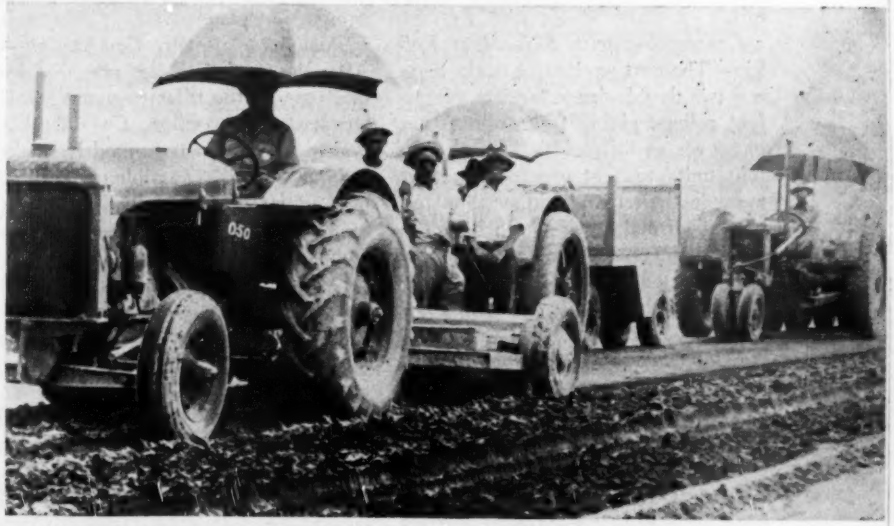


Fig. 7. Passage of rotary tiller at left is followed by tractors pulling pneumatic rollers. Early passage of roller seals surface and reduces moisture loss.

lineal foot of windrow could be determined and controlled.

Moist Mix—The third mixing machine, known as the moist-mix unit, followed closely behind that adding the water. This machine picked up the moist material from the windrow and completed the mixing, although no additional water was added at this time. This machine also left the material in a windrow. Thoroughness or uniformity of the moist mix was checked frequently at this stage by digging through the windrow. Also the cutting depth of each mixer was watched to avoid a layer of unmixed material at the bottom and to prevent the last mixer from cutting too deeply and adding raw unpulverized material at such a late stage of the mixing operations.

Laydown of Moist Mixed Windrow—Spreading of the windrow with a patrol grader followed immediately. The windrow was spread with one pass of the blade in such a manner that the fresh soil-cement mixture was sufficiently higher than the adjacent completed lanes to allow for compaction of the lane being laid.

Scarifying Prior to Compaction—Because the soil below the patrol tracks was quite firmly compacted and would have prevented uniform penetration and compaction of the rollers, the tracks in the loose, freshly bladed row had to be removed before the sheepsfoot rollers started compaction. Removal of the tracks was by one pass of a heavy-duty, spring-shank cultivator with power lift and depth adjustment. The cultivator was set to operate at the full depth of the mix.

Compaction with Sheepsfoot Rollers—The next equipment in the train was two double-drum, tandem sheepsfoot rollers, giving four rollings per pass over an 8-ft. width. The sheepsfoot units were staggered a foot or more in their travel, rather than following directly behind each other. This arrangement avoided a narrow uncompacted streak between the drums of the double units and assured a positive overlap.

Establishing Uniform Top Mulch—After passage of the sheepsfoot rollers, which compacted about the lower 3-in. of the mix, the lane was ready for the creation of a uniform-depth top mulch. Additional cement amounting to two percent by volume of the top 3 in. was added in a thin layer the width of the lane. For this operation a spreader of the type employed in placing aggregate in macadam road construction was employed.

CONTRACTOR'S EQUIPMENT

Using these tools the contractor was able to process 25,000 to 35,000 sq. yd. of soil-cement per day.

2—600-sack bulk cement trucks
1—Cement spreader that could be attached to the bulk trucks
1—Patrol grader with furrow plow attached
3—Patrol graders without plows
3—Mixing machines of the road-mix type
1—Rotary tiller of 6-ft. width
1—Spring-shank cultivator
1—Materials spreader
2—Double-drum, tandem sheepsfoot rollers (8 single drums)
4—Pneumatic rollers
1—Tandem, flat-wheel roller of 8 tons capacity
2—5,000-gal. water trucks with pumps to supply the mixers
3—1,000-gal. water trucks (gravity flow)
2—1,000-gal. pressure water distributors
3—1½-ton dump trucks
2—Pneumatic-tired manure spreaders
6—Hay trucks
2—Service trucks
1—Steel-bristled drag broom
8—Tractors of various sizes

In preparing the top mulch to a uniform depth, spring-shank cultivators and disc, spring-tooth, and spike-tooth harrows were used at the start of the job. Later a rotary tiller was obtained. This machine, which was adopted from truck gardening, was of the floating-rotor, flat-tine design, with a leveling hood. It did a better job in mixing and leveling the top mulch and eliminated the need for blading or leveling ahead of the pneumatic rollers. It left a fluffy, uniform-depth, well-mixed, level mulch free of compaction planes.

Pneumatic Roller Compaction—After the top mulch was prepared by one pass of the tiller pneumatic rollers started compaction. Considerable moisture loss was prevented by making, as soon as possible, a sealing pass or two over the full width of the mulch. Positive overlap and uniform compaction was assured by the rollers following each other in such a manner that each roller encroaching upon the lane being processed a greater distance, such as the width of a tire. The air pressure in the tires of the roller was kept equalized to minimize "rutting."

Scalping or Tight Blading—At the conclusion of the pneumatic rolling the surface was usually left slightly irregular. To correct this condition no filling was done during the final blading operation, since fill material added over a hard smooth area, such as that caused by a tire, would eventually crack and scale loose. Even if this surface under the fill was roughened, a plane weaker than the material above or below resulted. Cutting to a smooth firm surface by means of the blade that reached to the bottom of the lowest pneumatic tire track was the procedure that proved most satisfactory. The material shaved from the top was inferior, as it had been alternately dried and rewet and disturbed during rolling. This cutting, possibly ¼ to ⅜ in. in thickness, was left windrowed on the completed surface to be spread out later as part of the protective moist cover. It was found that a better grade and smoother surface resulted if this cut was made by two light passes rather than one heavy one. The smoothness of surface depended upon the caliber and workmanship of the blademan and he had to achieve the desired result by careful and accurate cutting with full realization that no filling would be tolerated.

Smooth Rolling—A tandem, 8-ton, smooth roller was started while the surface was still moist but dry enough that the roller did not pick up the surface material. Liberal overlap was made on successive trips of the rollers. Tight blading and subsequent smooth rolling followed as close as possible the processing of the soil-cement mixture. It was usually advantageous in securing a smooth surface finish to precede the tandem roller with a steel-bristled drag broom, which created a very fine mulch that dragged into the scars and abrasions.

Pneumatic Traffic Rolling—After the tandem machine had been over a section there were still small areas that the rollers "bridged-over." These were compacted and the whole surface sealed as a dense smooth finish by watering and then rolling with a comparatively light pneumatic-tired roller. This unit followed just close enough behind the water application that the free-surface water had disappeared and the surface material was not picked up by the tires. This rolling progressed across the width to be rolled by overlapping the greater part of the roller width on each successive pass.

Application of moist cover—A moist protective cover of 4 lb. of

straw per sq.yd. of surface was applied to the completed surface for cover as soon as possible after the final rolling. The straw, which was obtained from nearby stables, was spread by pneumatic-tired manure spreaders pulled by trucks. The spreaders distributed the straw over about a 5-ft. width in a thin uniform layer. Usually more than one trip was necessary to add sufficient straw. The waste windrows of soil-cement material bladed from the surface during finishing operations were also spread out and used as a protective cover. Water trucks with spray bars kept the cover moist and prevented evaporation losses in the underlying soil-cement.

At the end of a seven-day moist period, the straw was windrowed by a motor patrol. It was then loaded onto trucks and moved ahead for use on a new section. After thorough cleaning, the completed area was ready for use.

Laboratory Control

The field laboratory control was a very important part of work and the tests and inspection personnel was set up as follows:

1. Two inspectors checked the subgrade densities by making one test by the sand-cone method for each 2,000 sq. yd. of the area to be paved; the soil sample was taken at depth of 6 to 12 in.
2. One inspector checked the preparation of the grade and watched the scarifying, watering, etc., ahead of the processing.
3. One inspector supervised the spreading of the cement and kept a record as to the cement quantities.
4. Two inspectors were employed on moisture control. They made moisture tests by quickly drying the samples over a gasoline stove in a portable-field laboratory, which was pulled on skids from one day's work to the next. One inspector selected the samples, took them to the laboratory and on the next trip delivered the information to the mixer operator. The other worker dried the samples by constantly stirring them over the fire. One raw soil sample was obtained for every 1,500 sq.yd. to be paved. Moist-mix samples were taken on each windrow at 400-ft. intervals or for every 330 sq.yd. of pavement.
5. One inspector worked on the processing. He watched the mixers and checked depth control, the rolling, the surface moisture, the compaction planes, and the general progress and condition of the work.
6. One inspector supervised the addition and wetting of the straw and dirt cover or was responsible for the moisture control.
7. Checks as to density and depth of completed pavement were made by the same two men running the subgrade densities. One test was made by the sand-cone method for every 1,000 sq.yd. of pavement.
8. Moisture-density curves on the raw soil were prepared in a stationary central laboratory. The results established standard, maximum density and optimum moisture to which the field results on the subgrade were compared.
9. Moisture-density curves for the laboratory proportioned and for the mixed soil-cement were prepared in the central laboratory. One curve for each 6,000 sq.yd. of pavement was made before starting the processing. This work was to obtain advanced information on the total moisture requirements.
10. Moisture-density curves on the field-mix material also were prepared in the central laboratory. Samples selected at the conclusion of the moist mix were dried slightly to the dry side of optimum moisture additions.
11. Laboratory compacted specimens for actual field mix and at existing field moisture were made at the central laboratory. This test, which was made in conjunction with the running of the moisture-density curve of the field mix, gave the density expected from the field mix at its existing moisture when compaction by the standard laboratory method. Results from the moisture-density curve on the field mix (No. 10 above) indicated the optimum moisture and maximum density that should be used as the standard of comparison for the field results.

The stationary central laboratory mentioned was manned by a chief laboratory inspector and one or two assistant inspectors, as well as an inspector who did all the computing and recording. As the job progressed, the material variations were determined and the frequency of certain tests was reduced or adjusted to give the best control to meet the conditions at hand.

The soil-cement was under contract to Arizona Constructors for 26c. per sq.yd. for processing, plus $2.80 a barrel for cement. The job was sublet to I. G. Beall, contractor, who did the work. The work was under the direction of the Albuquerque District, Corps of Engineers, Colonel Lyle Rosenberg, district engineer; Lt. Col. Elmer S. Armstrong, regional engineer for the Fort Bliss region; Kenneth Gilbert, area engineer; E. V. Middleton, paving engineer, and Alfred Nixon, paving inspector.

Crews to Repair Pipe Breaks in Bombed Areas

In a large coastal city where enemy bombing attacks might occur, the entire area served by the municipal water system has been divided into 22 districts. In each district certain employees have been trained and specially equipped for making emergency repairs to broken water mains. During all hours of the night, a crew of two men is ready to be dispatched to the headquarters of each district to take care of any breaks that occur.

At the close of each work day the crew boss, who is on "stand by" duty for the night, takes with him the automobile that is assigned to his district. This machine is equipped with two sets of necessary wrenches. (Other tools and wood plugs for emergency closure of breaks in pipes from 3 to 16 in. in diameter are kept at each headquarters). The man with the car picks up the other crew member when an alert call comes. Each is expected to be ready to start for headquarters within a few minutes. The men are notified of an alert by a chain system of telephone calls.

The placement of wooden plugs for emergency closure of breaks in pipes is to be done in conjunction with demolition crews, who are to do most of the clearing out and preparing for the temporary repair, after the water has been shut off. The plugs ordinarily are put in only on a square cut and it is usually necessary to cut the pipe in order to obtain the proper bearing for the plugs. By prompt placement of the plugs the water pressure can be turned on again, thus maintaining fire protection service at full efficiency.

In addition to the crews that go into the field, the water department machine shop is manned in emergencies that occur at night by men who hold themselves in readiness to serve on certain designated nights. The machine shop crews are divided into three groups that alternate in the sequence of their standby periods. Thus in case alerts should be frequent, the same crew would not be called out several nights in succession.

Ready for junction box construction on one of the concrete duct lines for the new plant of General Electric Co.

Big Concrete Pipe Ducts Speed War Project

***Contents in Brief**—Use of reinforced-concrete pipe as the underground conduits for the heating system is a feature that has speeded construction of a new plant for the General Electric Co. In addition to heat and electric power, at least twelve other services had to be provided, and quick and satisfactory installation of these was possible by placing the necessary piping in the roof framing. All-welded roof trusses also made for rapid and economical erection, as the engineers found these trusses cheaper than riveted truss construction on other buildings of similar size.*

KNOWING that many materials were going to be hard to obtain, the engineers, in designing a new plant for the General Electric Co., used reinforced-concrete pipe placed under the floor slab for the heating ducts. This plan proved not only economical but made for rapid construction of the 4,500 lin.ft. of duct required, aiding in the early completion of the job. The plant provides over 100,000 sq.ft. of manufacturing space.

Exterior foundations call for a 13-in. thick, 4-ft. high reinforced-concrete grade beam between the exterior columns, which are on a 20-ft. spacing, each supported by a pile cap resting on two 50-ft. long, 14-in. dia. concrete piles designed for a 30-ton load. Immediately above the spandrel beams, a 4-ft. high 8-in. brick wall is backed up with 4-in. unglazed tile. Next, there is a 5-ft. band of 4-in. thick glass block construction with occasional steel sash windows, and then a 14-ft. band of corrugated asbestos sheathing backed up by a $\frac{3}{4}$-in. thick insulation board which is protected on both sides by a $\frac{1}{8}$-in. asbestos coating.

The exterior columns are 8-in., 24-lb., H-sections, while the interior columns are of 10-in., 49-lb. members. The latter, which are on a 40-ft. spacing the long way of the building and 50-ft. transversely, are each located on clusters of three 50-ft. long, 14-in. dia. cast-in-place concrete piles. The floor consists of an 8-in., reinforced-concrete slab covered by a $\frac{5}{8}$-in. mastic layer plus a $\frac{3}{16}$-in. asphalt floor tile. Since there is $4\frac{1}{2}$ ft. of fill from original ground to floor level, the slab is built independently of the exterior walls and interior columns to permit settlement of the floor without structural damage.

For the roof framing, 40-ft. span, all-welded jack trusses are used longitudinally at each row of columns, while transverse trusses of similar construction are used on a 20-ft. spacing. In the manufacturing area a 15-ft. clearance is provided. All-welded trusses were decided upon because they could be fabricated and erected with greater speed, and would effect a considerable saving in materials.

The purlins, which are 8 ft. 4 in. c. to c., consist of 10-in. I-beams varying in weight from 13 to 25 lb. Over these there is a ribbed steel roof deck, a 1-in. layer of insulation board, and then a 20-yr. slag roof. The roof is flat except for sufficient slope to provide drainage toward the first longitudinal rows of interior columns.

Advantages of concrete pipe

Reinforced-concrete pipe, which is delivered in 4-ft. length, was chosen for the underground conduits of the heating system because of: (1) Immediate availability of this type of conduit; (2) ease of installation; (3) economy afforded, and (4) adaptability of this pipe to minor changes in the foundation soil. Hot air for heating the building is supplied from two general heating rooms at the east side of the structure. After passing through the filters, and cooling and heating systems, the air for the factory is delivered by four electrically driven fans each of 60,000 cfm. capacity. For the two-story office area, which is located at one end of the building, conditioned air is delivered by one 40,000 cfm. fan.

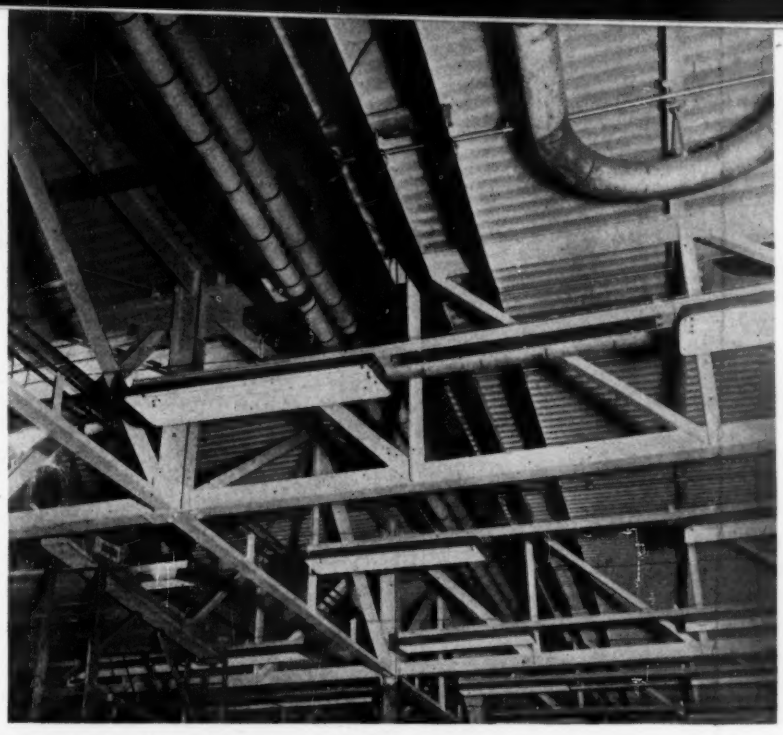
The hot air is carried by four 60-in., reinforced-concrete conduits, which are decreased in size until the final branches are 10 in. in diameter. Some 4,500 lin.ft. of reinforced-concrete pipe, all covered by at least 1 ft. of earth, was necessary. Air outlets are provided at the interior columns by openings varying in size from

8x24 to 9x30 in. Along the outside walls, 5x40-in. openings on 20-ft. centers are provided.

In the manufacturing area, sufficient fluorescent lighting units are used to provide a 60-ft.-candle intensity at floor level. Electric power for the lights is supplied by conduits inside asbestos-cement pipe, which is also buried below the floor slab. These pipes are inclosed in concrete, and take-off lines are carried up the columns. The power conduits for the varied equipment required are also carried in asbestos-cement pipe encased in concrete.

For disposal of the water used in the manufacturing processes, fourteen 9-in. wide, longitudinal trenches lined with reinforced-concrete are built in the floor slab. These vary in depth from 8 to 14 in. and are covered with checkered steel plate, except where a discharge outlet is desired. Flow from the trenches is into cast iron sewers running crosswise of the building on 60-ft. centers and varying in diameter from 4 to 8 in.

In addition to the facilities just mentioned, it was necessary to provide twelve additional services, including compressed air, illuminating gas, potable water, industrial water, oxygen, hydrogen, nitrogen, and several other gases. All the services enter the building underground, but once inside they are carried upward to the roof trusses and extended down the center row of columns. Tees are provided on 20-ft. centers and the 12 services are placed side by side in the same general grouping. Piping is supported by hangers carried by 6-in. channels spanning between the top chord of the longitudinal jack trusses and the first purlins. This arrangement makes necessary an increase in size of the first purlins from the usual 15-lb., 10-in. members to 23-lb., 10-in. I-beams. In all, about 6,000 ft. of piping is supported in the roof trusses for the 12 services, while the branches and extensions add another 6,000 ft.



In all, 6,000 ft. of piping, supported in the all-welded roof trusses, was necessary for distribution of the many services required. Note the fluorescent lighting.

In erecting the steel framework, truck cranes were used and it was possible to erect all steel for three of the bays, including the columns, in one 8-hr. shift. In erecting the 3,200-lb. jack trusses, eight field fillet welds were required at each end, four at the top chord and four at the bottom chord, as also was the case for each of the 3,500-lb. transverse trusses. The most satisfactory method was to erect the steel for one complete bay and then move into the next area. The metal roof deck and the purlins also were welded in place. The welding required for the steel framework, including that for the office area, was 2,900 lin.ft.

The Austin Company did the design and construction work.

Unusual appearance is afforded the building by the inclosure, which combines brick, corrugated asbestos siding and glass block windows.

Diary on a Deep Well Drilling Job

Carlton M. Roberts

Director of Public Works and City Engineer
Asbury Park, N. J.

***Editor's Note**—This is a story that will strike a responsive chord in the heart of every engineer. It deals with the trials and tribulations encountered in building a water supply improvement—priorities troubles, unexpected difficulties and the host of problems to which every construction job is heir. The author doesn't attempt to draw a moral from this experience. But he feels a lot better for the telling of it—and in this respect he will have a sympathetic audience particularly among municipal engineers.*

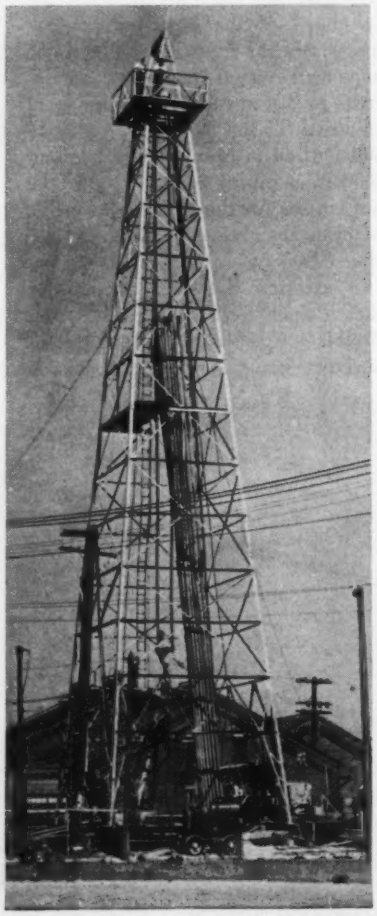
After Preparing fifteen pages of the usual specifications for a well, an advertisement was inserted in the local paper stating that lump sum bids would be received on March 25 for drilling a well, a turbine pump, and supplying a pump for an existing well.

On the appointed day we received only one bid—and this exceeded our estimated cost as well as the amount set up in the capital outlay budget. Lack of interest in the job resulted from the fact that the required well was 1,150 ft. deep and it would have to be built by rotary methods.

After much discussion with the City Council and combing of the eastern United States for more bidders, we readvertised on April 8. This time we received two bids. One of these just met the amount appropriated in the budget provided, however, that we delete the additional pump unit for the existing well.

After the contract was signed, and the successful contractor, The American Drilling Co. of Ridgewood, N. J. had furnished a satisfactory bond, we found that it was necessary to appeal to the War Production Board for various materials. Armed with a list of required material and a few ideas where it could be purchased with a priority rating, a trip to Washington was made on May 11.

Purpose of this visit was to speed approval of the application and to be sure that the application was properly filled in. After making out four types of applications and seeing five different men, each in a different building, we learned that we were working on the wrong application. After a night of troubled rest a new application was prepared and then we were directed to submit it to another department in another building. This done, we were assured that the application would be approved and returned to the city at an early date.



Heavy derrick rig employed to hold the drilling equipment and set the casing for the water well.

After waiting three weeks we finally broke down and wrote to our senator to ask if he could possibly expedite this matter as the city of Asbury Park was in dire need of more water for the summer season. On June 8, we received a priority rating of A-2. But some of the necessary material, including the deep well pump, was excluded. This started us scurrying around the second-hand markets to see if we could pick up some required items to complete the well.

Difficulties in drilling

So much for materials and equipment troubles. On June 12 we started erecting the drill derrick, which extended more than 90 ft. above the ground. It looked so much like an oil field operation that we had numerous telephone calls asking when we would strike oil.

While the derrick was being erected we found that we were able to obtain 40 ft. of 20-in. pipe and 1,200 ft. of 11¾ in. pipe from a supplier in Pittsburgh. Then we started to drill the hole.

Using a 22 in. roller type rock bit instead of the usual fish tail bit, a hole was drilled to a depth of 40 ft. and the 20 in. pipe was installed and cemented in place to prevent surface water drainage. After this pipe was in place drilling was continued with a 17¼ in. roller type rock bit. Progress was made at the rate of 100 to 125 ft. a day.

But trouble was ahead. Upon reaching a depth of 900 ft. a huge void was encountered; all the drilling mud plus two additional portions were lost and circulation could not be maintained with the pump. A few hours after the loss of circulation a cave-in was noted under the derrick footing indicating that the surface pipe was not deep enough and that water and material was being washed down the hole to fill this void. This

caused real concern—not only were we afraid of the derrick toppling over but the hole being only 25 ft. away from our settling basin, if undermined, would cause settlement and halt the supply of all water to the city.

Into this cave-in we first dumped some 10 cu.yd. of 1 in. washed gravel. Next we ordered 5 cu.yd. of concrete. While this was being delivered we threw in a couple of bales of straw and anything else that was handy. Then we placed the concrete in the hole bringing it up to the ground elevation, and left it for the night.

The next morning when we found that there had been a settlement of only about 6 in. it was felt that the concrete would prevent any further cave-in. With the belief that other active wells might be drawing material through the waterbearing strata towards them. all the wells were shut down in order to prevent possible further movement.

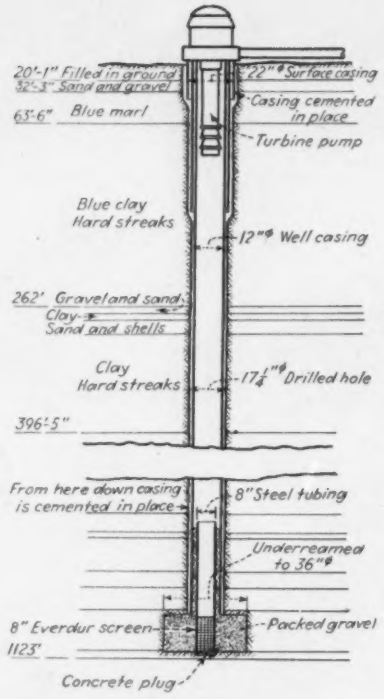
We then decided that our original surface casing was not deep enough and that we should place a 16-in. pipe approximately 160 ft. below the ground level. After setting and cementing this pipe in place we drilled the balance of the hole with a 15 in. roller type rock bit to a depth of 1,073 ft. below the derrick floor. Here we struck fine gray sand, and as the hole deepened, the sand became coarser and whiter and the drilling became very easy. We continued to drill to a depth of 1,160 ft. below ground elevation going through layers of coarse sand and gray gravel but found that the first layer of coarse gray sand stopped at a depth of 1,117 ft. It was then decided to set the 11¾ in. diameter pipe to the 1,075 ft. mark and under ream below this to make a hole 36 in. in diameter and to be 65 ft. below the casing.

Our next point of trouble was trying to set 11¾ in. pipe below the 900 ft. level. Due to the fact that the 15 in. diameter hole had to be fitted with an 11¾ in. pipe, the clearance was only 1⅛ in. on each side. Since it was necessary to maintain drilling mud circulation to prevent a cave-in and because the pipe failed to go into the hole easily the pipe was pulled up the derrick and then permitted to drop, in order to drive it into the hole until it had reached an elevation of 1,072 ft. A cement grout (1 bag cement and 4.5 gallons of water) was dropped into the pipe and circulated until excess grout came to the surface in the

Roller bits 17¼ in. in size and smaller that were used to drill the well. The operator is resting his hand on the under-reamer, which is employed to enlarge the bore at the base of the well to provide space for a gravel-pack.

Asbury Park Press photos

Equipped with a well-driller's hat, the author is shown here looking for trouble.



Section of the deep well showing type of construction at various elevations.

space between the pipe and the opening in the ground.

The grouted casing was permitted to set for 43 hours before it was under-reamed and before cutting out the plug in the botton of casing. Then an 80-slot Everdur screen, 35 ft. long, was installed.

Some 20 yd. of gravel was required to fill the cavity cut out by the under-reamers. The gravel was added slowly between the two casings and was continually washed out with clear water. Air pressure and a surge block were also used to break down the clay wall on the outside of the gravel pack. The hole cleared readily in a few hours and in that time no sand entered the screen; as a result we did not have to use a bailer at any point. After the gravel had been carried about 65 ft. above the screen in the annular space between the 11¾ in. outer casing and the 7 in. inner casing the well was developed and pumped with compressed air for 20 hours until the water ran clear.

While we were drilling the well we found that it was necessary to obtain an A-1-j rating for the deep well turbine pump; again we applied to Washington. The day after the well was completed the rating came through and we immediately ordered the pump and received shipment within ten days.

After installing the pump and 30 hp. motor, we performed a 24 hr. test and found that we obtained a yield of approximately 800 gal. per minute. Since this was 50 gal. per minute more than was guaranteed, we were well pleased with the outcome.

Happiness, however, was short-lived. On July 5, we had an electric storm, a bolt from which jumped over the switch fuses and burned nine rings of a large motor and left us without the use of the electric-driven compressor which served all the other wells at the plant.

Quick conversion was made to an antiquated steam-driven compressor to pump water. After five days of operation the main bearing of the steam engine burned out. It took three days to have this repaired. During this time we had to open our main interconnection with an adjacent water company. After getting the steam engine working it continued in operation for about a month following which various valves failed to cut off at the proper time and we were obliged to shut it down again and rely entirely on the new well with the turbine pump. It was then decided by the city fathers to make an emergency appropriation for the installation of an additional deep well turbine pump.

When we removed the air line from the well we found that the annular space between it and the 10 in. casing was practically filled with an iron deposit; this was caused by the compressed air coming in contact with the high iron content of water of the well. Removal of the iron deposit with a cutting tool held us up for two or three days before we could install the new electric-driven pump. We have operated now for a period of two months and find that our operating cost has been cut approximately 60 percent.

Now we are looking forward with zest to tackle another troublesome job.

Simplified Practice Recommendations For Steel Reinforcing Bars

The Division of Simplified Practice, National Bureau of Standards, has announced the publication of Simplified Practice Recommendation R26-42, Steel Reinforcing Bars.

The first edition of this recommendation, approved by the industry in 1924, established 11 cross-sectional areas, the purpose being to retain as many as possible of the advantages which had accrued to the industry as a result of simplification during World War I, under the guidance of the Conservation Division of the War Industries Board. The 1924 list reduced the prevailing variety of sizes from 32 to 11, an elimination of more than 65 percent. The recommendation was revised in 1930 by changing the sectional areas in square inches of the 11 sizes from thousandths to hundredths for convenience.

No further changes were made in the recommendation until the advent of the present war when the industry in collaboration with the War Production Board eliminated the ½-inch square bar as a conservation measure. Production, fabrication, or delivery of reinforcing bars is limited to the 10 sizes set forth in the revision by Schedule 1 to Limitation Order L-211, Concrete Reinforcement Steel, issued by the War Production Board on October 23, 1942.

In addition to the Simplified Practice Recommendation itself, which is effective from June 15, 1942, the new publication includes a brief history of the development of the project.

Copies of this recommendation may be obtained from the Superintendent of Documents, Government Printing Office, Washington, D. C., for 5 cents each.

"Portable" Fire Hydrants Used in England

After bombing experiences the authorities in some cities in England are reported to have removed their fire hydrants and capped the stubs. The fire engines now carry hydrants and set them in place as required. This practice is noted in a bulletin issued by the Illinois State Department of Public Health.

More About Renegotiation of Contracts

George R. Shields and Herman J. Galloway
Members of the firm of King & King, Attorneys, Washington, D. C.

***Contents in Brief**—The original act providing for the renegotiation of war contracts was amended by the Revenue Act of 1942. These amendments, while clarifying the original act in some respects, add more uncertainties and do not remove the fundamental injustices of the original act. The important changes made by the amendments are outlined and conclusions as to what action contractors should take in the light of these changes are given.*

THE MUCH DISCUSSED law providing for the renegotiation of contracts has been amended by certain provisions of the Revenue Act of 1942, approved Oct. 21, 1942. During the discussions of these amendments in Congress it was evident that many felt that the entire renegotiation law should be repealed. Others indicated a feeling that there should be very drastic changes, but in order not to delay the passage of the Revenue Act, to which the amendments had been added, certain changes were agreed to, which it was said would add clarity to the original "Renegotiation Act" and would remove some of its glaring defects. As so amended the law is still far from clear to contractors as to what it means and legitimately requires. This article is intended to discuss the act as now amended.

Most of the changes are merely formal, *i.e.*, intended to make the statute more precise in expressing matters that were probably already covered by or included in the original law. However, there are some real changes.

The original act

The original act was discussed and its terms stated in an article in *Engineering News-Record* Sept. 24, 1942, p. 424. To understand the present changes, the original act should be kept in mind. The previous article will need to be referred to in that connection.

Amendments to the act

The principal additions of substance made to the original act are:

1. Whereas the original act purported to give authority to renegotiate contracts entered into by the War Department, the Navy Department and the Maritime Commission, the new law includes also contracts entered into by the *Treasury* Department. This means that contracts for public buildings are now included in the act.

2. The new law defines "excessive profits" as follows:

> (4) The term "excessive profits" means any amount of a contract or subcontract price which is found as a result of renegotiation to represent excessive profits.

It is not clear whether this means such sum as the secretary of the department concerned may *determine* as excessive or such sum as may be *agreed* upon by both parties to be excessive after a discussion, negotiation and meeting of minds between them.

3. The amendment defines "subcontract" as follows:

> (5) The term "subcontract" means any purchase order or agreement to perform all or any part of the work, or to make or furnish any article, required for the performance of another contract or subcontract. The term "article" includes any material, part, assembly, machinery, equipment, or other personal property.

4. The new law permits the secretary of the department concerned to require a renegotiation clause in a subcontract entered into by a subcontractor, in other words, a sub-subcontract.

5. The amendment permits the secretary, in his discretion, in entering into contracts thereafter made to (a) fix periods of time within which renegotiation may be had, or (b) if, in the opinion of the secretary, the provisions of the contract or subcontract are otherwise adequate to prevent excessive profits, the contract may provide that renegotiation shall apply only to a portion of the contract, or shall not apply to performance during a specified period or periods and that the price in effect during such period or periods shall not be subject to renegotiation. The indefiniteness and uncertainty of this part of the amended statute lies in the fact that while this does not say that the secretary may specifically exclude an *entire* contract from renegotiations, such conclusion can probably be made by making the portions of the contract or periods of time excluded sufficiently broad or large as in fact to exclude the entire contract. This amendment, on the whole, would seem to be an improvement over what was originally provided.

Contracts grouped

6. The amendment specifically provides that when the contractor or subcontractor holds two or more contracts, the secretary, in his discretion, may renegotiate to eliminate excessive profits on *some or all* of them as a *group* without separately renegotiating *as to each one*. It is probable that this right was within the powers given by the original law, but it is now more clearly expressed.

7. The amendment provides "The surety under a contract or subcontract shall not be liable for the repayment of any excessive profits thereon." It should be noted that this purports to exempt the surety only in cases where the contractor has been paid and the government seeks repayment of the alleged excessive profits but is silent as to instances where the government withholds payments to the contractor or undertakes to reduce prices to be paid as to future work or materials. An interesting question may arise as to whether exempting the *surety* from liability may not relieve the contractor, its principal, from similar liability.

8. The amendment then provides

that in the determination of excess profit deductions, account is to be taken of chapters 1 and 2E of the Internal Revenue Code and of the credit given for federal income and excess profit tax as provided in Section 3806 of that code. This perhaps is an attempt to avoid double deductions on the same account. Question: Who first gets to and deducts the "excess profits", the government as a contractor, or as a tax collector?

Renegotiation made final

9. The amendment further provides that upon renegotiation the secretary may make such final or other agreements for the elimination of excessive profits and the discharge of liability therefor as he deems desirable, and such agreement shall be final and conclusive and shall not be reopened except for fraud, malfeasance or misrepresentation of a material fact. This gives very broad and rather undefined power to the secretary. It also makes a contract or contracts once renegotiated final and removes the possibility of several successive renegotiations of the same contract or contracts, as appeared possible under the old law. Since the amendments elsewhere provide that they shall be effective as of April 28, 1942 (the date of the original act), it seems that as to contracts which may have already been renegotiated, that renegotiation is now final and conclusive, although such was not the case when the renegotiation actually took place. Question: Suppose such "renegotiation" is not accepted by the Bureau of Internal Revenue as final—what will happen? Where will the contractor be?

10. The amendment provides in substance that contractors or subcontractors having contracts subject to the renegotiation law may file with the secretary of the department concerned statements of costs and other data as to any prior fiscal year or years and that the secretary may within a year fix a date for an initial conference to be held within 60 days, and if the notice is not so given and renegotiation is not so begun, there shall be no renegotiation or elimination of excessive profits upon the contracts involved during such fiscal year or years. Thus the contractors by filing such statements may begin the running of the time within which renegotiation must be had or the contractor be relieved. However, it should be noted that if the secretary begins the renegotiation conferences within the time fixed there is no limit fixed as to how long a time the conferences, discussion and determination may be extended, during all of which time the contractor will not know what may be the outcome of all of this proceeding.

11. The amendments provide that no renegotiation shall be commenced more than one year after the close of the fiscal year of the contractor within which the completion or termination of the contract, as determined by the secretary, occurs. This somewhat shortens the time within which renegotiation *must be started*. But once started there again is no limit fixed as to *how long* it may be before a *decision is made*. Also, what is meant by completion of the contract? Does it mean completion of the work or final payment under the contract?

Some contracts excepted

12. The amendment then excepts certain contracts from the operation of the law. The principal exceptions are contracts with other branches of the government, or with states or foreign governments, contracts for the product of a mine, gas or oil well, mineral or natural deposit, and timber not processed beyond the first form or state. These are of small import to most construction contractors.

13. The secretary is authorized, in his discretion, to exempt from some or all of the provisions of the renegotiation law contracts to be performed outside the territorial limits of continental United States or in Alaska. The secretary may also except contracts under which he believes profits can be determined with reasonable certainty when the contract price is established, such as certain classes of agreements for personal services, for the purchase of real estate, perishable goods or commodities having minimum prices fixed by a public regulatory body, leases or licenses or contracts to be performed within 30 days.

The secretary may also exempt a portion of a contract or performance thereunder during a specified period or periods, if, in his opinion, the provisions are otherwise adequate to prevent excessive profits.

These exemptions would seem to apply to contracts made after the passage of the law, but they may also have been intended to apply to contracts already made if the secretary feels that such contracts adequately prevent excessive profits. The law authorizes the secretary to exempt contracts individually or by general classes and types. These exemptions are important, depending only upon how liberally the secretary may exercise the authority conferred thereby. Normally, it would appear that a contract made as the result of public advertisement and competitive bid might be beyond the pale for further "negotiation."

It will be seen that the secretary is given very broad powers and discretion and much in the way of details, procedure and even substance is left to his judgment and discretion. He is given broad powers to issue regulations, interpretations and definitions upon the statute. The secretary may delegate to others all or any part of the duties and powers given to him by the statute.

Conclusions

The amended act but little, if at all, removes the fundamental injustice of the original act. It still remains that a contract legally made, if the amendment is valid law, may be abrogated by one of the parties without the consent of the other. Some of the inequities of the amended act are:

1. It seems wrong to try to force upon a contractor a new contract price when he bid upon work in free and open competition under which the government could have rejected his bid if found excessive. The government now seeks to take away part of his profits, yet had the contractor bid too low and lost (as happens often) there is no attempt made to reimburse those losses.

2. If the contract price was the result of fair negotiation, it seems unfair to change a price fairly agreed upon and in fact practically dictated by the government officers. Of course, if there was *fraud* in making the contract the government could and should recoup all profits without any renegotiation law.

3. Another important objection to the amended statute is that it provides no yardstick to determine what is *proper* and what is *excessive* profits and it leaves contractors wholly at sea as to what is their financial situation until the years have passed during which there is

conducted a renegotiation, or the period of time elapses during which renegotiation might be started. This financial uncertainty severely affects the contractor in financing existing work, procuring bonds, taking on new work, and in many other ways.

4. One of the most outstanding objections is the attempt to force renegotiation as to contracts entered into before April 28, 1942.

The law purports to permit renegotiation of any contract upon which final payment had not been made on April 28, 1942, regardless of *when* the contract was entered into. It is seriously doubted whether renegotiation can be compelled under this law where the contract was entered into before April 28, 1942. Contractors have many rights under such contracts. This includes the right to be paid the prices stipulated therein. It is doubted whether the Constitution of the United States permits even Congress to take away those rights without paying for the same.

In view of the many questions which may be raised under this law, even as amended, the best advice to contractors is that if one of the specified federal departments seeks to start renegotiation proceedings, the contractor should, if he feels the facts warrant, freely and fully furnish the information requested and should make every proper effort to procure a decision by the secretary that there have been no excessive profits. If the secretary decides there have been excessive profits, the contractor, after he has been fully advised as to what are his rights under the law, must then decide whether he will accept or resist that determination. In order that the contractor may then be in a position to resist the determination, if he sees fit to do so, he should at every step duly protest and reserve his rights. This should be done from the time the first request for information is answered and should be repeated at each step in the "renegotiation proceedings."

Polio Virus and Water Purification

Harve J. Carlson, Gerald M. Ridenour and Dr. Charles F. McKhann,

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***Contents in Brief**—Presence of poliomyelitis virus in sewage-polluted waters raises questions concerning the efficacy of water purification in the removal of the virus. Preliminary studies at the University of Michigan indicate that no individual unit of the purification process will remove the virus completely, but that each has some effect. Further, it is revealed that the initial concentration of the virus suspension plays a role on the amount of virus remaining in the water after treatment.*

DURING RECENT YEARS poliomyelitis virus, the cause of infantile paralysis, has been repeatedly demonstrated to be present in sewage (1), (2), (3). Also the work of Toomey (6) and more recent workers (7) in this field of investigation indicates that the disease may be contracted through the gastrointestinal portal of entry. On these premises it becomes a possibility that water may be a hazard in the transmission of the disease. In view of this it is of interest to know the effect of modern methods of water purification on the removal of the virus. Studies in this connection have been conducted by the University of Michigan School of Public Health and the Department of Pediatrics and Communicable Diseases, University of Michigan Medical School, aided by a grant from the National Foundation for Infantile Paralysis, Inc.

The investigations were conducted in a manner to determine the effect of the various units used in water purification on the removal of the virus. Care was used to approach as nearly as possible standard water purification practices such as detention periods of coagulating, and settling tanks and rates of filtration. Studies were made to show the effect of storage, sedimentation with alum-lime coagulation, sand filtration, adsorption by activated carbon, hydrogen-ion concentration and ultra-violet irradiation.

The effect of water storage was conducted by adding virus suspension to sterile tap water. Samples were then stored for 100 days and portions removed at intervals varying from 1 hour to 100 days for inoculation into test animals.

Coagulation and sedimentation was studied by flocculating virus-contaminated waters with alum and lime at pH 6.3, 6.7, and 7.0 for a period of from 20 to 30 min. This was followed by 3½ hr. sedimentation. The supernatant liquor after sedimentation was used for inoculation.

The influence of sand filtration was studied by passing the water containing virus suspension through 30 in. of Ottawa filter sand, of 0.508 mm. effective size and unformity coefficient of 1.24, at a rate of 125 million gallons per acre per day. These tests on sand filtration were carried out under two conditions, (a) without coagulating the waters previous to inoculation and filtration and (b) with coagulated waters to secure the benefit of the filter "schmutzedecke."

Adsorption by activated carbon was studied by mixing in the contaminated water fine activated carbon with a phenol coefficient of 30, and injecting samples of the supernatant liquor into the test group of animals.

Experiments with ultra-violet irradiation consisted of exposing various depths of virus suspension to ultra-violet light placed at various distances from the sample.

Six animals were used for each

test in each stage of the experiment, together with adequate controls.

Results of studies

Storage—In waters stored at refrigerator temperatures the virus remained viable for as long as 100 days. Of 90 mice in one group receiving the water stored this length of time 38 developed paralysis. In all groups of lesser numbers 2 or more developed paralysis. In the control groups all mice but one succumbed with paralysis. In the water control group not receiving the virus all remained alive.

Coagulation and Sedimentation—Paralysis developed in one or more mice of each group that received virus suspension. However the percentage of animals that developed paralysis was not as high as in control groups that received untreated virus-contaminated waters of the same dilution. Alum flocculation and sedimentation appeared to cause a slight reduction of the total amount of virus in suspension. This reduction was apparently proportional to the amount of virus present in the untreated sample.

Filtration—When sand filtration alone was used 29 of the 60 mice inoculated with the filtered water became paralyzed. Apparently sand filtration alone held back little of the virus. However, when large quantities of alum floc were allowed to impregnate the sand and form the "schmutzedecke," of 54 mice receiving the virus water only 1 animal developed paralysis. In this one case the paralysis was also less extensive than in most of the control mice.

Activated carbon adsorption—With activated carbon used in concentrations of from 10 to 50 ppm. there seemed to be a definite adsorption and partial removal of the virus particles. The numbers of mice which became paralyzed when inoculated with the water so treated were less than in the control groups. This partial adsorption by the carbon was further demonstrated by the high percentage of animals succumbing to injections of the settled activated carbon particles.

Ultra-violet irradiation—Although sterilization of waters by ultra-violet rays is not a standard method of treatment, numerous investigations have been made on such treatment for destruction of bacteria in waters. Ultra-violet irradiation was used in this same sense in these studies on destruction of virus.

When the light distance was 8 in., length of exposure 5 min. and depth of virus suspension $\frac{5}{16}$ in. one mouse became paralyzed. With exposures of 10, 15, and 25 min. no animals developed paralysis. In the control samples untreated by the rays, the usual numbers of animals became paralyzed.

In further studies in which the light distance and depth of suspension were varied, 2 animals out of 18 became paralyzed when the light distance was 8 in. and the depth of suspension $2\frac{1}{2}$ in. With light distance 3 ft. and depth of $\frac{1}{2}$ in. one mouse became paralyzed. In the control group of 18 mice receiving untreated water all but one became paralyzed.

Summary

In studies on the effect of present standard methods of water purification on removal of poliomyelitis virus from water it is indicated that none of the purification units removed the virus completely. However, each has some effect on removal of the virus. The initial concentration of the virus suspension plays an important role on the amount of virus remaining in the water after treatment. This is consistent with and parallels experience with bacterial removals in the water purification process where each of the plant units is responsible for its component part of the total overall removal of organisms. Here also the organisms remaining after treatment is related to the initial concentration in the applied untreated waters.

These studies have not been made to measure the additive effect of the individual units of purification, but rather to determine which units have an effect on virus removal. Forthcoming studies will be made to evaluate these combined processes of water purification.

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Maintaining Sewage and Refuse Disposal Service in Bombed Areas

Maintenance of sewer service in bombed areas has been one of the major difficulties confronting municipal authorities in cities under enemy attack. To assist American municipal officials and defense councils in planning for emergencies and for the restoration of normal services following damage resulting from enemy action, the sanitary engineering section of the Medical Division of the Office of Civilian Defense has issued its second sanitary engineering bulletin, *Municipal Sanitation Under War Conditions*.

The bulletin emphasizes the importance of accurate and complete information on the sewerage system, such as maps and records of all critical points at which a broken line would create a serious drainage problem and interrupt service over a considerable area. Inventories of material, personnel and equipment that could be used in the event of necessity are of value not only to the sewer department, but also to other municipal departments, public utilities or neighboring communities. Such inventories should even include the resources of local dealers or manufacturers of building materials, explosives, pipe and equipment that could be used in reconstruction of sewers.

One section of the bulletin is devoted to discussion of municipal waste collection and disposal in the event of enemy action. The sanitary landfill is recommended as the method of disposal that could be most readily adopted. The problem of operating an incinerator during a blackout is also discussed.

An appendix to the bulletin contains Operations Letter No. 29 issued by the Office of Civilian Defense on "Utility Repair Squads" and Operations Letter No. 37, which explains how utility company personnel may be authorized to perform their duties during blackouts; designs for emergency latrines or privies; photographs and description of a newly developed sanitary excreta bag, and a bibliography of recent literature pertinent to the subject.

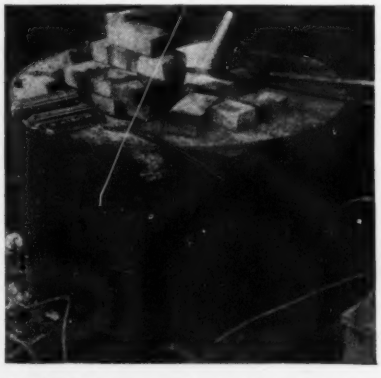
From Field and Office

WORKING PROBLEMS AND TIME-SAVING METHODS FOR ENGINEERS AND CONTRACTORS

Gas Furnace Uses Butane For Plate Shop Pre-heating

Use of butane gas for heating rivets at Marinship has been an easy first step toward substitution of this fuel for natural gas in the furnaces used at that yard for pre-heat work in the plate shop. The job-made device shown in the accompanying picture consists of a steel cylinder, about 4 ft. in diameter, heavily lined with firebrick so that an opening only about 1 ft. square leads upward from the gas burner in the base to the zone at the top, where loose bricks are piled up around the part to be heated. Gas reaches the burner through a pipe in the base whose control valve can be seen in the lower right of the picture.

The furnace was devised by William Blackfield, assistant area planning engineer, Marinship Corp.

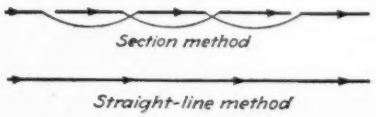


Pre-heat furnace using butane gas, competes with natural gas fuel.

Ditchers Operating In Tandem Speed Trenching Operations

In completing their section of the Texas-Illinois "Big Inch" pipeline, the Oklahoma Contracting Co., Dallas, Texas, introduced a practical method of economically increasing the daily production of their trenching operations.

Previous practice of pipeline contractors on jobs of this character was to lay out the ditching in sections and use two ditchers. This necessitated much wasted time in "roading" of a ditcher when it completed its section and had to travel around the section being cut by the other machine.



The daily production of two trenching machines can be increased by the straight-line method illustrated. The curved lines in the section method indicate wasted "roading" time.

Oklahoma Contracting used a "straight-line" method of ditching by having each of its ditchers cut trench to one half of the depth required, the first machine cutting the upper half and the second machine cutting the bottom half. This allowed both machines to operate in the top range of digging speeds and eliminated the waste time required in "roading" when using the "section" method.

The "straight-line" method also was of benefit in case of service interruption with one of the machines, since unditched portions between sections are eliminated. Further, this method eliminated the severe service placed on the crawlers in the "roading" operations.

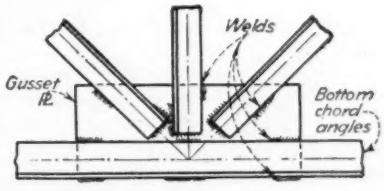
The diagram shown at the top illustrates the contrast between the two types of operation.—*Contributed by S. L. Penote, Sales Manager, The Cleveland Trencher Co., Cleveland, Ohio.*

Field and Office Comment

Economies in Roof Truss Design

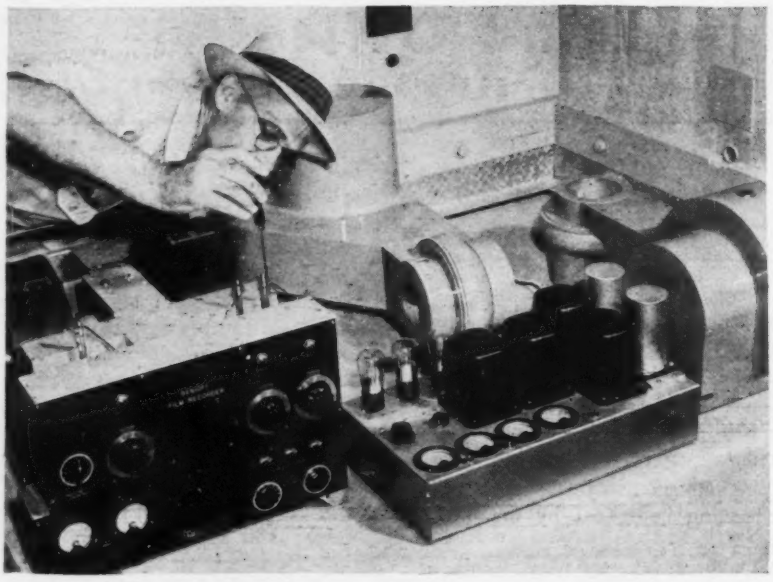
Sir: Referring to the article on "Maintaining Full Section of Truss Chord Angles" by Claude S. Wilson in *ENR* Sept. 24, 1942, p. 445, I should like, in the interests of economy, to point out that while the method outlined does achieve the result of allowing full sectional area of the bottom chord to be maintained, the ensuing shop costs, due to combining both riveting and welding on one piece, will be more than double the cost of the following solution to the problem.

Since the problem is to save steel by maintaining the full sectional area of the bottom chord, it would be better to eliminate the holes entirely as shown in the accompanying sketch. This layout eliminates the following shop operations: (1) Laying out the holes in chord L_s, web L_s and gusset plate P_s (1 man); (2) punching the holes in the members just mentioned (2 men); and (3) fitting up and riveting the members (4 men). The new layout would leave only the following operations: (1) Fitting up (1 or 2 men) (A simple jig results in further economies), and (2) welding (1 man). Some of the welding had to be done in the layout planned by Mr. Wilson in order to maintain the full sectional area of the bottom chord.



An all-welded joint, when compared to a design that is partly welded and partly riveted, eliminates three shop operations. Welds are made of sufficient strength to withstand stresses.

While this letter is not intended as an argument for all welded design, the simple fact remains that welding was necessary in the first place in order to maintain full sectional area of the bottom chord L_s. Therefore, it is the writer's opinion that the inclusion of riveting in the design, which would involve laying out of the holes, punching the holes and driving the rivets, is economically unsound. This belief is further heightened by the fact that in many fabricating shops the welding is done at a different location in the shop than the riveting, thereby resulting in extra handling of the trusses.—*Wilbur R. Crabtree, Structural Engineer, Meehan Steel Products Co., Ironton, Ohio.*



For Measuring Vibrations in Grand Coulee Dam

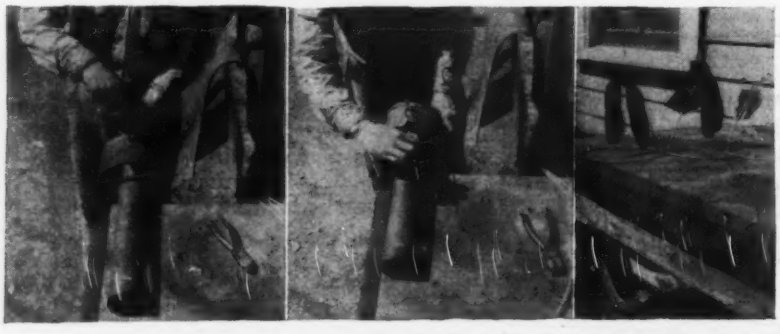
These instruments for measuring even the slightest tremors that may occur at Grand Coulee Dam, include three seismometers (one in each of three planes at right angles) and a recording unit. Extremely sensitive instruments of this sort are installed at other important dams throughout the West and constitute part of the field equipment used by the U. S. Coast & Geodetic Survey in engineering seismological research.

Flags for Fresh Traffic Stripes Made with Jig

A quick way to make wire frame holders for the red flags that mark freshly painted center stripes and other pavement markings on highways has been developed by superintendent T. W. Martin in the Whittier office of the California Division of Highways.

A short piece of 8-in. pipe is welded to a longer section of 3-in. pipe and is fastened to a work bench to serve as a jig. About ¾ in. of the end of pre-cut wire is thrust into a hole in the 8-in. pipe, the wire is bent at right angles and then is wrapped once around the pipe to form a circular base about 8 in. in diameter. To make a sharp upward bend at the completion of the base circle, the wire is first lowered between a screw and the head of a bolt fastened in the jig. Finally, after removal from the jig, the upper end of the wire is bent with the aid of the same pipe hole that was used at the start.

The wire can be shaped into top and bottom loops and the flag tied on at the rate of 1½ min. per marker. An experiment is being made on two different sizes to determine relative visibility and ability to withstand air suction of passing vehicles.



Successive steps in use of a pipe jig to bend wire into traffic flags.

Pile Driving On Steep Slopes

An ingenious pile-shoe was devised during recent construction of a timber pile wharf in the Gulf of St. Lawrence. Some of the piles had to be driven after necessary dredging; the final shape of the dredged slope was steep and irregular, as the soil was a stiff marine clay.

Driving the piles when fitted with ordinary shoes proved impossible, as they slipped quickly out of line as soon as the driving hammer touched them. Bracing was too cumbersome to be practical and even its use, in some cases, failed to prevent serious displacement of the piles. Finally, after many trials, the special pile shoe shown in the accompanying photograph was devised by William Harney, construction superintendent of Quebec City in charge of the work. Formed of a piece of 3-in. pipe, cut at one end as shown, and about 16 in. long, the shoe was fitted to a pile as the later was suspended in the leads. The weight of the pile and hammer gave enough penetration to the pipe-shoe to ensure fixity of the pile in its location when driving commenced. No trouble was encountered in keeping to accurate alignment with the use of these shoes.—*Robert F. Legget, assistant professor, department of civil engineering, University of Toronto, Toronto, Canada.*

When pile driving on steep slopes proved difficult, shoes of the type shown above provided the necessary fixity.

THE HANDLE WITH CARE sign is important today. It belongs on every tool and on every piece of equipment in America. We can't afford a speck of waste, and even the toughest equipment will last longer when cared for properly.

For example, your sturdy, long-lived, dependable Exide Batteries will last even longer if you follow the simple maintenance steps given on this page. The rule of the day is *Handle With Care.* Treat your batteries right . . . and you help treat the Axis rough.

MAKING BATTERIES LAST HELPS STOP THE AXIS!

1 Keep adding approved water at regular intervals. Most local water is safe. Ask us if yours is safe.

2 Keep the top of the battery and battery container clean and dry at all times. This will assure maximum protection of the inner parts.

3 Keep the battery fully charged—but avoid excessive over-charge. A storage battery will last longer when charged at its proper voltage.

4 Record water additions, voltage, and gravity readings. Don't trust your memory. Write down a complete record of your battery's life history. Compare readings.

If you wish more detailed information, or have a special battery problem, don't hesitate to write to Exide. We want you to get the long-life built into every Exide Battery. Ask for booklet Form 2399.

Exide

BATTERIES FOR CRANKING DIESEL ENGINES

THE ELECTRIC STORAGE BATTERY COMPANY, Philadelphia
The World's Largest Manufacturers of Storage Batteries for Every Purpose
Exide Batteries of Canada, Limited, Toronto

CONTRACT UNIT PRICES

What contractors are bidding on different kinds of construction work

PEDESTRIAN PASSAGEWAYS SUBWAY, CHICAGO

OWNER: City of Chicago, Dept. of Subways and Superhighways.

PROJECT: Finishing pedestrian passageways and access mezzanines (Contract 5-A) for State Street Subway in Chicago, Ill. Includes furnishing and placing colored concrete for floors, landings, bases, stairs, and base for stairs; Class A concrete; non-slip treads; straight and curved structural glass for walls; terra cotta trim; glazed wall tile, etc.

CONDITIONS: Contractor to furnish all materials and complete work in 150 calendar days. Rail and highway transportation facilities available. The project, when completed, will provide access to State Street Subway via the Dearborn Street Subway. Wage rates are: skilled labor, $1.70 to $1.825 per hour; and common labor, $1.10 per hour.

BIDS: Seven bids were opened November 27, 1942. (Re-advertisement of bids rejected in opening of November 16th.) Bids ranged from the low of $87,748 to $100,016.

LIST OF BIDDERS:

1. C. E. Carson Co., Chicago, Ill. (low bidder) $87,748
2. G. Kehl Sons, Chicago, Ill. 89,700
3. W. E. O'Neil Constr. Co., Chicago, Ill. 91,110
4. Consolidated Construction Co., Chicago, Ill. 91,624
5. John Traff, Chicago, Ill. 91,975
6. Gerhardt F. Meyne Co., Chicago, Ill. 95,970
7. Morris Handler Co., Inc., Chicago, Ill. 100,016

Item	Quan.	Unit Prices (1)	(2)	(3)
1. Colored concrete floors and landings	14,500 s. f.	$0.688	$0.70	$0.67
2. Colored concrete base	2,100 l. f.	.80	.80	.80
3. Colored concrete stairs	1,400 l. f.	2.28	2.25	2.35
4. Colored concrete base for stairs	620 l. f.	2.00	2.00	2.00
5. Class A concrete	Lump Sum	4,290.00	3,500.00	3,100.00
6. Non-slip treads	850 s. f.	2.58	2.00	2.80
7. Straight structural glass for walls	1,450 s. f.	2.98	2.90	3.10
8. Curved structural glass for walls	750 s. f.	3.70	3.65	4.00
9. Terra cotta trim	650 s. f.	7.00	7.75	8.20
10. Glazed wall tile	15,000 s. f.	1.68	1.65	1.65
11. Wooden doors, metal frames and hardware	Lump Sum	2,744.00	1,500.00	1,530.00
12. Marble for columns	Lump Sum	1,425.00	1,500.00	1,575.00
13. Street railings	Lump Sum	12,887.00	14,000.00	14,350.00
14. Plywood barricades and timber stairs	Lump Sum	2,400.00	2,000.00	1,375.00
15. Handrail	Lump Sum	1,548.00	1,300.00	2,000.00
16. Misc. iron castings and steel	Lump Sum	1,784.00	2,400.00	2,700.00
17. Electrical work	Lump Sum	1,977.00	3,700.00	2,750.00
18. Reconstruct timber street stair entrance and wood decking over station stairwells of Dearborn St. subway	Lump Sum	1,870.00	2,500.00	3,700.00
19. Insulate house drains through vent shafts of State St. and Dearborn St. subways	Lump Sum	1,696.00	1,700.00	2,150.00

HIGHWAY, VIRGINIA

OWNER: Virginia Department of Highways, Richmond.

PROJECT: Construction of 4.5 miles of waterbound macadam roadway with mixed-in-place bituminous surface on Route No. 11 from 4.1 miles east of the eastern city limits of Dublin, Pulaski County, Va., to a point 0.37 miles west of the eastern city line.

CONDITIONS: Contractor to furnish all materials and complete work by June 21, 1943. Rail and highway transportation facilities available. Wage rates stipulated are: skilled labor, $1.25 per hour; semi-skilled, 80c.; and common, 45c. Sixty percent of the excavation required is rock.

BIDS: Four bids were opened October 6, 1942, ranging from the contract low of $412,217 to $644,987.

LIST OF BIDDERS:

1. Pendleton Constr. Corp., Wytheville, Va. (contract) $412,217
2. Keeley Constr. Co., Harrisonburg, Va. 476,369
3. Sutton Co., Inc., Radford, Va., and Sam Finley, Inc., Roanoke, Va. 564,714
4. Bero Engr. & Constr. Corp., Blackstone, Va. 644,987

Item	Quan.	Unit Prices (1)	(2)	(3)
1. Clearing and grubbing	1 ac.	$200.00	$300.00	$200.00
2. Regular excavation	248,752 c. y.	.75	.83	.83
3. Brrow excavation	6,706 c. y.	.60	.75	.83
4. Class A concrete	205 c. y.	25.00	22.00	30.00
5. Class C concrete	77 c. y.	25.00	25.00	40.00
6. Metal reinforcing	24,855 lb.	.06	.07	.08
7. Right-of-way monuments	108 ea.	2.50	2.00	2.40
8. Center drain, CD-1 or CD-2	1,644 l. f.	.50	.60	.45
9. 18-in. concrete pipe	2,496 l. f.	2.50	2.50	3.00
10. 18-in. pipe (3000D)	165 l. f.	2.50	3.00	3.25
11. 24-in. pipe	633 l. f.	3.25	3.50	4.00
12. 24-in. pipe (3000D)	204 l. f.	3.50	3.75	4.50
13. 36-in. pipe (3000D)	297 l. f.	7.00	8.00	8.50
14. 18-in. concrete pipe	27 l. f.	2.50	2.50	3.00
15. 1-in. galvanized iron pipe	60 l. f.	.50	.40	1.00
16. Reset right-of-way monument	4 ea.	2.00	1.00	5.00
17. Fed.-aid project markers	3 ea.	4.00	5.00	5.00
18. Reset project marker	1 ea.	3.00	3.00	2.00
19. Std. curb catch basins	8 ea.	150.00	40.00	100.00
20. Class X concrete (steps)	3 c. y.	50.00	35.00	45.00
21. Mortar rubble masonry	46 c. y.	20.00	12.00	28.00
22. High early strength std. gutter	173 l. f.	1.50	2.50	2.00
23. Radial conc. curb and gutter	94 l. f.	1.80	2.00	3.25
24. Plain conc. curb and gutter	4,250 l. f.	1.50	2.00	3.00
25. 8-in. h.e.s. conc. (entrances)	22 s. y.	3.00	4.00	5.00
26. 4-in. concrete sidewalk	200 s. y.	2.50	4.00	3.00
27. No. 9 stone (entrances)	87 ton	2.00	2.50	2.76
28. No. 13 stone	26,617 ton	1.50	2.50	1.76
29. 6-in. waterbound macadam	2,036 s. y.	1.00	.83	1.09
30. 8-in. waterbound macadam	678 s. y.	1.20	1.10	1.27
31. 9-in. waterbound macadam	307 s. y.	1.20	1.25	1.37
32. 10-in. waterbound macadam	9,756 s. y.	1.30	1.40	1.54
33. 10-in.-9-in.-10-in. waterbound macadam	81,867 s. y.	1.20	1.30	1.47
34. RT-4 or RT-5 bitum. material	31,614 gal.	.14	.16	.149
35. RT-5 or RT-6 bitum. material	1,118 gal.	.14	.16	.149
36. Covering material	67 ton	3.00	2.90	3.76
37. RT-5 to RT-11 bitum. material	92,607 gal.	.14	.16	.164
38. Covering material	4,630 ton	3.00	2.90	3.76
39. Topsoil	2,400 c. y.	1.50	1.50	1.25
40. Seeding	100,000 s. y.	.01	.05	.03

SEWER, NEW JERSEY

OWNER: Town Council, Bloomfield, N. J.; J. W. Obreiter, town engineer.

PROJECT: Construction of depressed Supplementary Union Outlet Sewer beneath Second River, near Mill Street, Belleville, and Walnut Street, Bloomfield, N. J. Length approximately 500 feet, and pipe laid to depth of 15 ft.

CONDITIONS: Contractor to furnish all material. Highway transportation facilities available to site of work. Common labor rate 87½c. per hour.

BIDS: Two bids were received November 2, 1942, the contract low of $31,773, and $35,000.

LIST OF BIDDERS:

1. J. R. & M. C. Fusco, Inc., Montclair, N. J. (contract) $31,773
2. Whippany Construction Co., Hanover, N. J. 35,000

Item	Quan.	Unit Prices (1)	(2)
1. Earth excavation and backfill	1,500 c. y.	$4.50	$6.00
2. Resurfacing, loaming and seeding	310 s. y.	.50	.60
3. Resurfacing, pavement	20 s. y.	6.00	7.00
4. Class A concrete masonry	300 c. y.	30.00	35.00
5. Class B concrete masonry	150 c. y.	14.00	20.00
6. Steel reinforcement	1,500 lb.	.10	.10
7. Brick masonry	15 c. y.	20.00	40.00
8. Miscellaneous iron work	3,300 lb.	.10	.08
9. 30-in. tile-lined depressed pipe	134 l. f.	8.50	8.00
10. 36-in. tile-lined depressed pipe	135 l. f.	9.50	8.25
11. 36-in. unlined rein. conc. pipe	30 l. f.	6.20	5.50
12. 54-in. unlined rein. conc. pipe	100 l. f.	8.60	11.00
13. 60-in. unlined rein. conc. pipe	100 l. f.	10.95	11.50
14. Rock excavation	600 c. y.	4.50	5.60
15. Lumber, left in place	5 M bm.	125.00	120.00
16. Connections to existing sewers	Lump Sum	2,000.00	1,250.00
17. Cleaning up	Lump Sum	200.00	300.00
18. Remove river crossings	Lump Sum	2,000.00	1,250.00

1942 MARKS ALL-TIME HIGH IN BUILDING SPEED

THE YEAR 1942 added a bright new page of achievement to the record of the building industries. Under the pressure of war necessity, the 'impossible' has been achieved time after time, and the year just ended marks an all-time high in building speed.

Lone Star Cement and 'Incor' 24-Hour Cement play an important part in obtaining quality concrete with speed and economy. Many of the year's fastest war-speed records were made on jobs where both of these cements were used, in accordance with the time-tested principle of

SELECTIVE CONCRETING

which simply means selecting for each part of the job the type of cement which produces maximum speed at lowest cost.

Over 15 years' construction experience shows that on most jobs there are critical points where 'Incor's* dependable high early strength saves time and money—while on other parts of the job Lone Star in turn produces the requisite speed and economy.

Many carefully planned and skilfully executed jobs which won acclaim in 1942 once more confirm the advantages of selective concreting and point the way to sound construction values in the years ahead. May they soon be years of peace with Victory!

*Reg. U.S. Pat. Off.

LONE STAR CEMENT CORPORATION

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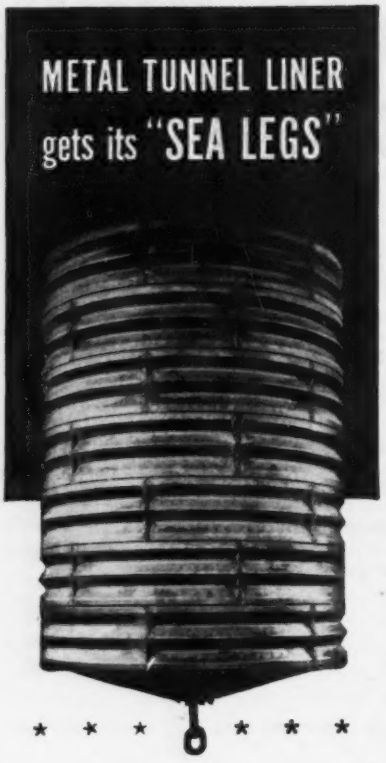
LONE STAR, WITH ITS SUBSIDIARIES, IS ONE OF THE WORLD'S LARGEST CEMENT PRODUCERS..15 MODERN MILLS..25-MILLION BARRELS ANNUAL CAPACITY



War is changing the shape of steel. Now it is tanks, planes and guns instead of peacetime products. Occasionally, as in this Navy buoy, you'll recognize an old familiar friend. It's a wartime, nautical version of ARMCO Tunnel Liner Plates.

Perhaps it will help remind you how much ARMCO Liner Plates will some day contribute to easier, safer tunneling. Gage for gage, ARMCO heavy duty liner is stronger (section modulus) than any other plate. On a strength—weight basis it costs less at the start. Work moves fast because one man handles the light sections and only structural wrenches are needed for assembly. Where completed rings can be spaced to take advantage of partly self-supporting ground, you may actually buy fewer plates.

Remember that after the war ARMCO Liner Plates will be back — better than ever before — to help you cut costs and speed tunnel work. Armco Drainage Products Association, 605 Curtis Street, Middletown, Ohio.

ARMCO

TUNNEL LINER PLATES

New Aids to the Constructor

Equipment and material announcements and manufacturers' news

Fiber Conduit Application

In view of the current metal shortage, interest has been shown in the possibilities of fiber conduit such as Bermico, a product of the Brown Co., manufacturers of wood cellulose products. In production of Bermico, wood cellulose fibers are

scientifically built up and heat-treated to form rugged tubes with a solid homogeneous wall structure. These tubes are then impregnated by a special process to produce a chemically inert, light weight pipe with high mechanical strength and water resistance.

Much of the pipe is put under ground each year for installation of electrical cables. Lately, Bermico fiber conduit has been used in place of critical metal conduit. Another new application is for inside drain pipe to carry off rain water. In addition, the manufacturer says that certain types of Bermico seem to offer possibilities as a soil pipe, as well as for drainage lines and as casing in shallow oil wells.—*Brown Co., 500 Fifth Ave., New York, N. Y.*

Protective Paint

As a further step in the conservation of vital metals, E. S. Phillips, president of Devoe & Reynolds Co., Inc., has announced the development and marketing of "Bar-Rust metal protective paint." Production of this new paint is intended for the protection of outside or interior surfaces of industrial plants or other structures having appreciable amounts of exposed metal. The metal protective system embodies three qualifications necessary to make this paint protective in the strictest sense of the word. First, the system includes a number of rust inhibitive primers which prevent the development of rust and grasp hold of the metal itself to provide a tough and elastic film that will expand and contract at the same ratio as does the metal over which it is applied; second, the paint includes a number of finish coat materials of different colors designed to go over the primers and stand up to an outstanding degree in the face of all exposures; and third, both primers and finish coat materials are so formulated that they will flow out in a uniform thickness and have the ability to cling to the surface around sharp edges, rivet heads, bolts, etc.—*Devoe & Reynolds Co., Inc., 44th St. and 1st Ave., New York, N. Y.*

Mask for Glass

A new waterproof, protective and abrasion-resistant mask for plastic glass bomber noses and windshields, that sprays on and peels off, called Adhere Spraymask, has been announced by Adhere, Inc.

Although primarily used by aircraft plants, Adhere Spraymask has many as yet unexplored uses in other types of

production requiring a temporary protective mask or coating against paint, grease, abrasion, wind or weather. The Spraymask is easily applied with an ordinary paint spray gun, and afterward may be peeled off in a sheet.—*Adhere, Inc., Los Angeles, Cal.*

Portable Turnstiles

Designed for use in plants where truck entrances must also be used for employee entrances during changes of shift, a turnstile with base-plate and guide railing mounted together as a portable unit, can be quickly and easily moved into

place, and removed to a new location with little effort. It is not necessary to fasten them down to the pavement. They are available with foot-pedal control for gate guard, or in token-controlled models operated by employees' time discs.—*Percy Turnstile Co. of New York.*

OWNERS of Cummins Diesel powered equipment are setting new production records . . . doing more work . . . in less time . . . at a lower cost.

It took a call for super-power to fully demonstrate the engine's capacity for extra work and speed . . . its low operating cost in the face of a demand for double duty.

It took a drastic shortage in men and materials to prove the full worth of the Cummins Customer Service Policy . . . a policy which has always given first consideration to the owner.

That's why today's broken records forecast a still better Cummins Diesel for tomorrow.

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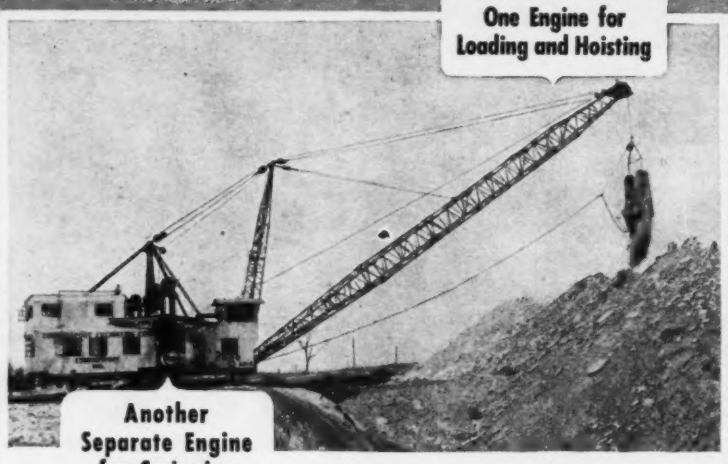
CUMMINS
Dependable
DIESELS

SOLVING TODAY'S
Need for Speed
THE PAGE DIESEL-POWERED
Two-Engine DRAGLINE



• A dragline with only ONE engine frequently pulls down and lags when it must bear the brunt of loading and hoisting PLUS SWINGING. The moment you add the swing . . . she "bogs" down.

The new *Page* TWO-ENGINE Dragline eliminates this time loss by having one engine for Loading and Hoisting AND ANOTHER SEPARATE ENGINE FOR SWINGING! Each engine working independently of the other.

By using two powerful, compact *Page* HORIZONTAL Diesel Engines — one above the other — the *Page* TWO-ENGINE Dragline saves precious seconds on every pass. MOVES MORE DIRT PER SHIFT. It's the "diggin'est dragline you ever saw."

* * *

Today *Page* draglines are only available for work contributing to the war effort, but after "V-Day," we'll have a *Page* TWO-ENGINE dragline for everyone who wants to MOVE DIRT *FASTER*.

PAGE ENGINEERING CO.
Chicago, Illinois

PAGE
Two-Engine
DRAGLINES

Manufacturers' Activities

JAMES M. HAIT, for many years chief engineer of the PEERLESS PUMP division of the FOOD MACHINERY CORP., has been named general manager of a newly created division of procurement and engineering. Mr. Hait, credited with many firsts in pump design, has been working on development of war weapons for the armed services.

The EDWARDS division of ROGERS DIESEL & AIRCRAFT CORP. at Sanford, N. C., recently received the joint army-navy "E" pennant.

CHARLES G. PYLE, general sales manager of SYLVANIA ELECTRIC PRODUCTS, INC. (formerly HYGRADE SYLVANIA CORP.), has been appointed managing director of the NATIONAL ELECTRICAL WHOLESALERS ASSOCIATION. The appointment is effective immediately. Mr. Pyle has been identified with the lighting industry since 1920, when he was placed in charge of the Pittsburgh warehouse of the then Hygrade Lamp Co. He was district sales manager in Baltimore when the company merged with the Sylvania Tube Co. in 1932, and became assistant sales manager for incandescent lamps of the newly formed Hygrade Sylvania Corp. In 1939 he was made general sales manager of the lighting division.

E. O. CALLANDER has been appointed sales representative for GENERAL ELECTRIC wiring materials in Ohio with headquarters in Cleveland.

DAVID S. YOUNGHOLM, 53, vice president of the WESTINGHOUSE ELECTRIC & MFG. CO., in charge of the company's lamp division at Bloomfield, N. J., died recently. During a career of more than 33 years with Westinghouse, Mr. Youngholm became an authority in the lighting industry. Under his direction, the lamp division was converted to 95 percent war production re-

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Haste Need Not Make Waste

Conditions which make for accidents that handicap your operations . . . are growing steadily worse

HASTE is imperative, for our war effort needs new construction . . . yet haste invites accidents. Your experienced men are leaving for service . . . and green men are more apt to get injured. New types of equipment . . . the substitute materials you are sometimes forced to use . . . the lack of trained foremen — all add to the difficulty of keeping work safe.

A POTENT ALLY AGAINST ACCIDENTS

Faced with a problem full of new complications, more and more contractors have turned to American Mutual for aid in combatting this threat to efficient work.

American Mutual has specialized for many years in safety services for contractors. Our field representatives and safety consultants have contributed to the successful completion of thousands of building enterprises and today are on the job from Maine to Texas — helping to guard our war projects from delays and losses due to accidents.

American Mutual not only will help you establish proper and proven controls for your special conditions but will also provide as close a follow-through as those conditions require. We urge you, in the interests of fulfilling your part in the war, to insist upon the thorough accident-prevention service that only a firm with American Mutual's experience can be expected to provide.

In addition, you, like all contractors who have ever insured with American Mutual, have the opportunity to save at least 20% of premium costs.

FREE BOOK FOR FOREMEN!

Valuable information for new foremen . . . "refresher" material for experienced foremen. Write for "Foremanship" to American Mutual, Dept. O18, 142 Berkeley St., Boston, Massachusetts.

American Mutual Liability Insurance Company

AMERICAN MUTUAL — WORKS FOR YOUR SAFETY

Admitted Assets	$47,908,092.19
Liabilities	40,659,020.90
Surplus to Policyholders	7,249,071.29

As of December 31, 1941

Brooks "Truck-saving Plan" for '43

. . . is a step toward victory as it conserves equipment and reduces hauling costs . . . so just mount a LOAD LUGGER on the chassis, and make one truck do the work of many. By using several detachable "bodies" or buckets, you can load, haul and dump *continuously* . . . no waste time by idle trucks waiting for loadups. Try this modern dump-truck unit for speeding up your material handling operations. Write today for Catalog #44.

Use 5 to 10 buckets with each Load Lugger for maximum economy.

Brooks LOAD LUGGER

2212 Davenport Road, Knoxville, Tenn.

Distributors in all Principal Cities

Brooks EQUIPMENT AND MFG. CO.

. . . If you want to make speed profitably . . . GET DEPENDABLE EQUIPMENT *. . Buy the Fast . . .*

JACKSON Hydraulic Concrete Vibrator

DESIGNED TO "TAKE IT" 3 SHIFTS A DAY—EVERY DAY

- Automatic pressure lubrication—requires no attention.
- 34-ft. hose—2¾" vibrator head.
- Adjustable frequency to 6800 R.P.M.—submerged in concrete.
- Powerful gas engine—4.7 H.P.
- Long-lived, ball-bearing, rotary, hydraulic pump.

USED EXCLUSIVELY BY MANY LARGE DEFENSE CONTRACTORS

ELECTRIC TAMPER & EQUIPMENT CO.

LUDINGTON, MICHIGAN

cently. He was born in New York City, and joined Westinghouse in 1909.

LOREN DICKERSON, a member of the staff of ARTHUR D. LITTLE, INC., consultants on industrial research in Cambridge, Mass., was recently elected to membership in the 200 Associates of Phi Beta Kappa, the national scholastic honorary society. Mr. Dickerson, 24, is the youngest member of the group and the only industrial chemist in the organization.

The LASTIK PRODUCTS CO. INC., manufacturers of calking compounds, roof cements and paints, of Wampum, Pa., recently took over the Wampum plant of the Federal American Cement Tile Co.

Seven shipyards and nine manufacturing plants, located in all parts of the United States, have been designated to receive high Maritime Commission "M" awards and gold stars for meritorious production. The shipyards are: the DELTA SHIPBUILDING CO., INC., New Orleans, La.; BETHLEHEM-FAIRFIELD SHIPYARD INC., Baltimore, Md.; CALIFORNIA SHIPBUILDING CORP., Wilmington, Calif., NORTH CAROLINA SHIPBUILDING CO., Wilmington, N. C.; OREGON SHIPBUILDING CORP., Portland, Ore.; RICHMOND SHIPYARD No. 1, Richmond, Calif., RICHMOND SHIPYARD No. 2, Richmond, Calif. The manufacturing plants are: ALCOA division of the AMERICAN LOCOMOTIVE CO., New York City, N. Y.; COOPER-BESSEMER CORP., Mt. Vernon, Ohio; DAVIS ENGINEERING CORP., Elizabeth, N. J.; FEDERAL TELEPHONE & RADIO CORP., Newark, N. J.; M. W. KELLOGG CO., Jersey City, N. J.; NATIONAL SUPPLY CO., Springfield, Ohio; PRODUCTION ENGINEERING CO., Berkeley, Calif.; TUBE-TURNS, INC., Louisville, Ky.; and YOUNG IRON WORKS, Seattle, Wash.

ERIC P. TEEL, former vice president and general manager of the NOVO ENGINE CO., Lansing, Mich., died recently. Joining the Novo organization in 1908 as shop superintendent, he was elevated to the position of vice president and general manager in 1932, on the death of Clarence E. Bement, his predecessor. Mr. Teel was one of the organizers of the Contractors Pump Manufacturing Bureau, serving as chairman of the bureau for a period of three years.

Look behind this CURTAIN OF STEEL

See how America is conserving this vital war material on the *production* front for use on the *firing* line. Step into a Lock Joint fabrication plant and note the economy and skill with which it employs its steel allotments.

The core and ribs of each length of pipe are formed by a steel cylinder and encircling cage—and it is this steel skeleton that safeguards against pressure and stress. By adapting pipe design to closely conform with the hydraulic and operating conditions along the route of installation, Lock Joint Reinforced Concrete Pressure Pipe provides maximum strength with a minimum use of war-essential steel.

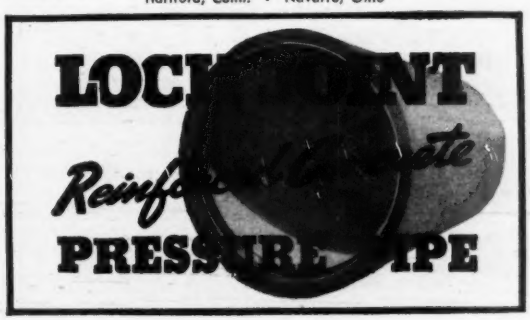
Behind America's battle lines lie the water supply lines of your community. Keep them flowing. Insure their long life and dependability. Specify Lock Joint Reinforced Concrete Pipe.

LOCK JOINT PIPE COMPANY

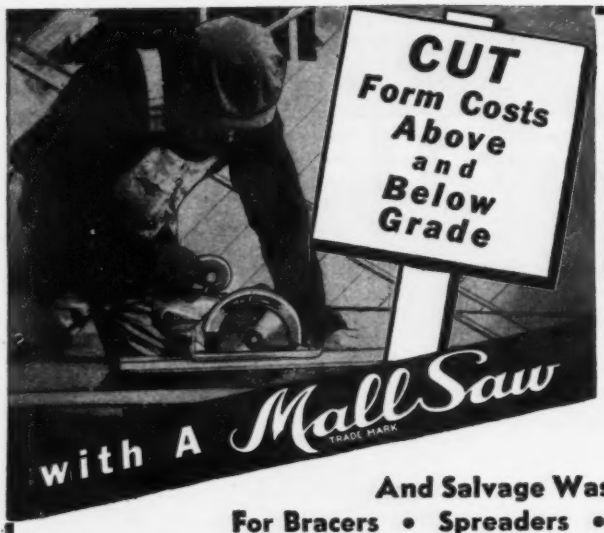
Established 1905

AMPERE, NEW JERSEY

Denver, Colo. • Chicago, Ill. • Kenilworth, N. J. • Kansas City, Mo.
Rock Island, Ill. • White Plains, N. Y. • Valley Park, Mo. Cleveland, Ohio
Hartford, Conn. • Navarre, Ohio



SCOPE OF SERVICES • *Lock Joint Pipe Company specializes in the manufacture and installation of Reinforced Concrete Pressure Pipe for Water Supply Mains as well as Concrete Pipe of all types for Sanitary Sewers, Storm Drains, Culverts and Subaqueous lines.*



And Salvage Waste Lumber

For Bracers • Spreaders • Stoppers

This powerful, fast-cutting MALLSAW reduces form construction to a few simple operations. It assures perfectly square board ends, eliminating fins and projections. It permits a carpenter to gang and cut boards for entire section at one time. It does away with awkward hand sawing below grade as boards cut to size can be passed to the man in the trench faster than he can nail them in place. And, in addition, it enables contractors to use small ends and pieces ordinarily discarded.

MALLSAWS are balanced for safe, one-hand use, easily and quickly adjusted for depth and bevel cuts to 45 degrees, simple and easy to use. A Big time and labor saver for War Projects.

Write AT ONCE for literature and prices.

MALL TOOL COMPANY

7730 SOUTH CHICAGO AVE. CHICAGO, ILLINOIS

Offices and Distributors in Principal Cities

BLAW-KNOX GRATING
They are looking at 5 OUTSTANDING FEATURES
Easily maintained paint reaches entire surface
Electroforged one-piece construction
Non-Slip because of the twisted bar
Maximum open area for light and air
Self-Cleaning no sharp corners to clog
Send for FREE paper weight size sample

BLAW-KNOX DIVISION of Blaw-Knox Co.
2001 FARMERS BANK BUILDING · PITTSBURGH, PA.

NAME_____

STREET_____

CITY_____ STATE_____

NEW PUBLICATIONS

Winter Trouble—Bulletin No. 1038, called "Keep Ahead of Winter Troubles," has just been issued by the Hauck Mfg. Co. It describes Hauck thawers and heaters which are universally used for removing snow and ice that may be troublesome or interfering with production; superheated steam thawers used by municipalities, state and county highway departments, army and navy establishments, electric and gas utilities, fire departments, and others; and concrete heaters, water heaters and salamanders which are used on winter construction work.—*Hauck Mfg. Co., 124-136 Tenth St., Brooklyn, N. Y.*

Production Topics—A new bulletin just issued by the American Locomotive Co. describes its Alco clamp ring joints used on heat exchangers and is said to be of timely interest because Alco clamp ring joints reduce the weight of steel necessary from 5 to 15 percent.—*American Locomotive Co., 30 Church St., New York, N. Y.*

Expansion Bolts and Anchors—American Expansion anchors for widening, repairing and resurfacing existing concrete highways, as well as American hook inserts and J bolts that may be used in enlarging, renovating and building aircraft runways, military highways and other concrete structures, are described in a new catalog, No. 42. Blasted runways and highways can be repaired in less than 24 hours with American expansion hook anchors and quick setting cements with no more separation or sag —present or future—between the new section and the old than if the surface were in its original undisturbed condition. Specifications of construction of the bolts and anchors are given in great detail.—*American Expansion Bolt & Mfg. Co., Chicago, Ill.*

Using Drills—A new handbook just published by the Black & Decker Mfg. Co. is designed to show new workers the correct method of using portable electric drills and obtaining greatest efficiency and longest life from these war production tools. The booklet covers such points as assembling the drill, switch control, drill chucks and bits, how to use the drill, and several important points on user maintenance and care.—*Black & Decker Mfg. Co., Towson, Md.*

Batteries—Valuable hints on the care of storage batteries, whether in industrial use or in automotive service, are given in the current issue of the industrial edition of Exide News, under the heading of "The Great Devourer."—*Electric Storage Battery Co., 19th St. and Allegheny Ave., Philadelphia, Pa.*

High Speed Safe Operation

Positive control assures accurate spotting for setting steel.

Ratchet control is a click of safety . . . clutch control means faster movements. Unite these and the operator has high speed and safe operation. While the boom is raising or lowering, Koehring Cranes swing and travel swiftly and safely. This double action is an all-important time saver when handling material, spotting concrete buckets, setting steel or forms. Under heavy stress or strain booms may be lowered by power for rapid and secure operation. With Koehring every move is a production move . . . every move is a faster move . . . every move is a safer move.

KOEHRING COMPANY
MILWAUKEE • WISCONSIN

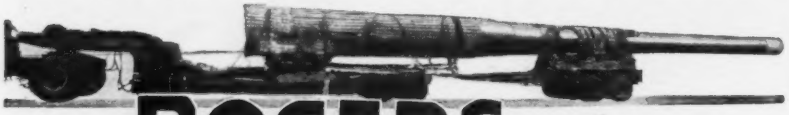
KOEHRING HEAVY DUTY

HEAVY-DUTY CONSTRUCTION EQUIPMENT

Tanks move doggedly forward wreaking havoc on the enemy but their speed is necessarily slower than trucks and their span of continuous service considerably more limited.

So they crawl up on Rogers Trailers and are moved quickly to the line of combat—or from it when repairs or reconditioning becomes necessary.

Thus, the effectiveness of an important combat unit is increased manifoldly by these non-combat vehicles.



ROGERS
LOW BED-
-HEAVY DUTY
TRAILERS

ROGERS BROTHERS CORP., ALBION, PENNA.

TIME-TESTED JOINTING COMPOUND
for Bell and Spigot Water Mains

10 REASONS FOR USING

1. One lb. HYDRO-TITE equals 4 lbs. lead.
2. Stands any pressure the pipe can.
3. Joints showing seepage will take up.
4. Requires no calking so speeds job.
5. Anyone can make tight joints.
6. Permanent as the pipe itself.
7. Stands deflection and vibration.
8. 30 years without a failure.
9. Shipped promptly.
10. Demonstration without charge.

Write for JOINTING BOOK

HYDRAULIC DEVELOPMENT CORP.
50 CHURCH STREET — NEW YORK, N. Y.

MEN AND JOBS

Cy Washburn, assistant chief engineer of the Jacksonville, Fla., city water and electric engineering department, recently was named to the post of chief engineer succeeding **R. L. McCall,** who entered the armed services a month ago. At the same time, **J. B. Cox,** an engineer in the utilities department, was promoted to assistant chief engineer.

Arthur E. DeLoriea, formerly assistant superintendent of the Michigan State Ferries at St. Ignace, Mich., has been appointed cost inspector for the U. S. Navy at Toledo, Ohio.

R. McC. Beanfield, consulting engineer of Los Angeles, Cal., has been commissioned major in the Corps of Engineers and assigned to active duty with the district engineer at Los Angeles.

H. J. Hanlon is now serving as station construction engineer for the Plantation Pipe Line Co. on the extension of an oil pipe line from Greensboro, N. C., to Richmond, Va.

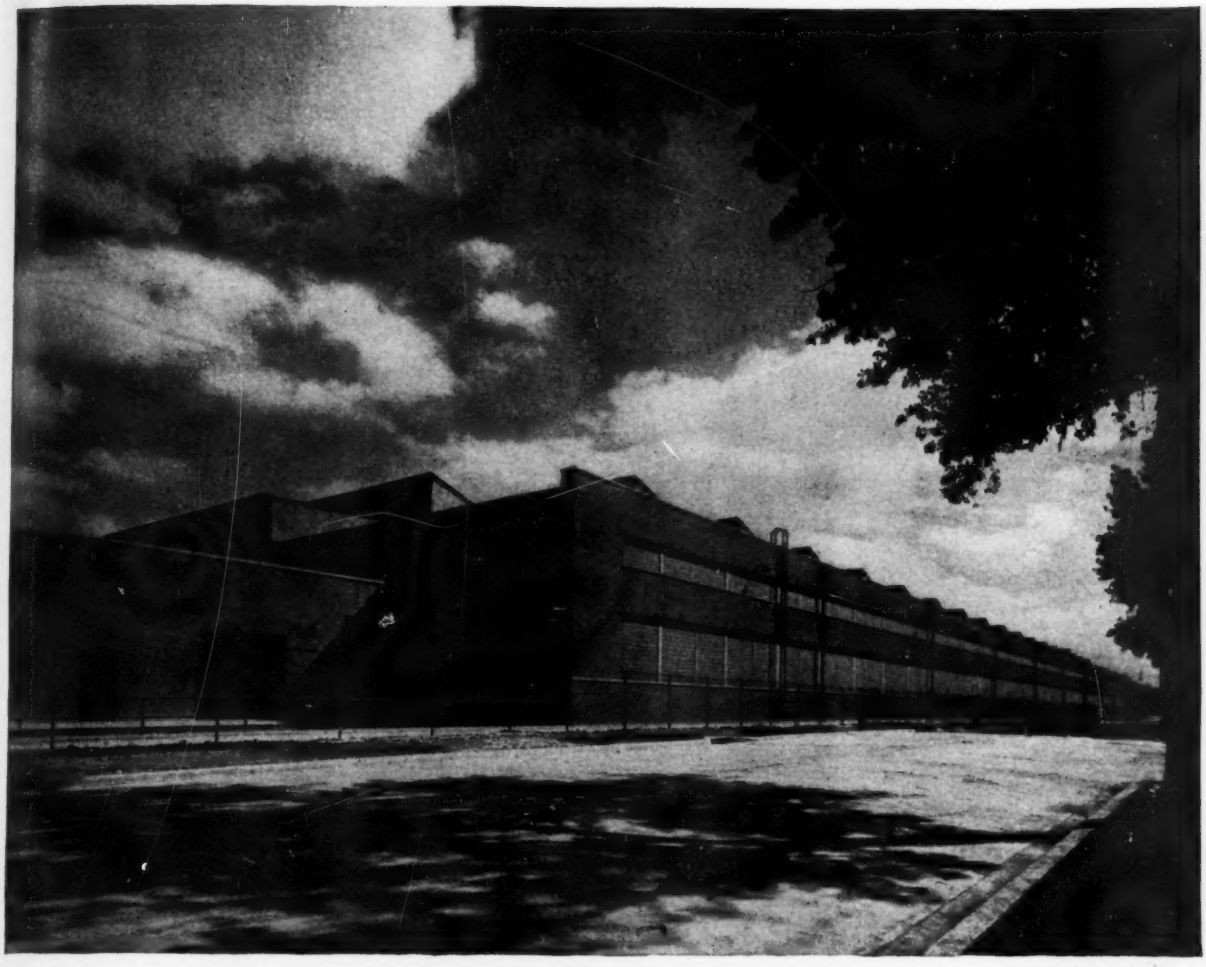
Theodore T. Knappen has withdrawn as a partner of the consulting engineering firm of Parsons, Klapp, Brinckerhoff and Douglas, New York, and has opened an office as a consulting engineer under his own name at 132 East 72nd street, New York City. Mr. Knappen had been with Parsons, Klapp, Brinckerhoff and Douglas for about five years, devoting his time largely to the firm's operations in South and Central America. Previous to joining that firm, he was for nine years with the U. S. Engineer Department as an area engineer on the Mississippi River, chief of engineering division on the Muskingum Valley Conservation project and as principal engineer in charge of flood control for the North Atlantic Division.

Col. Leland H. Hewitt, formerly district engineer at Galveston, Texas, recently assumed command of the 52nd Combat Engineer regiment at Camp Butner, N. C.

Glenn Gibson, county engineer at Fort Myers, Fla., for the past 14 years, has accepted a commission as a first lieutenant in the Corps of Engineers.

Lt. Col. R. E. M. DesIslets has been named district engineer at Kansas City, Mo. for the Corps of Engineers. Colonel DesIslets recently supervised work at Bonneville Dam and other Pacific Northwest projects.

Lt. Lyle C. Molstad, Sparta, Wis., who has been assistant area engineer on con-



Architects: Johnck & Ehmann
Contractors: James Stewart Corp.

CX4521

In a heavy black ledger in Bethlehem is a number, CX4521. It represents the plant you see above. Because of war censorship, Bethlehem cannot reveal the identity of this important plant, but can present a few design and construction details about it.

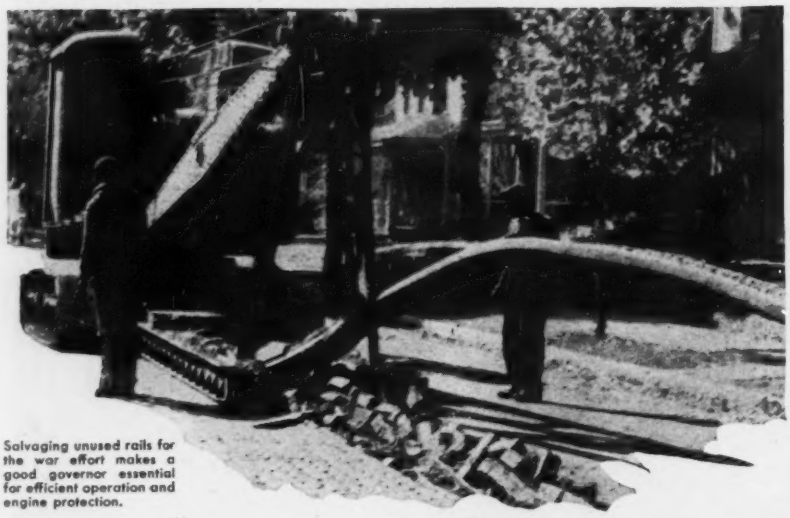
CX4521 stands for a rolling mill building and office building erected somewhere in the Great Lakes area. The plant is to be used for forming one of the most vital materials of war.

The mill building, shown above, measures 360 ft. by 900 ft. and is made up of four aisles extending 840 ft. Glass brick has been used extensively throughout. Attached to the south end of the mill building is the two-story office building, measuring 40 ft. by 80 ft., and designed in the same clean-cut style as the mill building. The fabrication and erection of the 3000 tons of steelwork for these two structures was carried out by Bethlehem.

That black ledger in Bethlehem contains columns and columns of similar job order numbers, representing construction, often in record time, of scores of structures such as bomber assembly plants, tank arsenals, engine plants, and Army Air Corps hangars. The ledger thus gives a concise picture of the enormous amount of construction Bethlehem has handled to help produce the materiel of war.

BETHLEHEM STEEL

BETHLEHEM STEEL COMPANY



Salvaging unused rails for the war effort makes a good governor essential for efficient operation and engine protection.

It's on a Tough Job like this, you need **PIERCE** *at the throttle!*

HOW TO MAKE YOUR GOVERNORS LAST!

Like others manufacturing for war needs, Pierce production is for war and essential industry. For this reason new governors can be supplied only on a priority basis. But Pierce calls attention to these easy measures which will make your present Pierce Governors last and give the best service.

- **CLEAN GOVERNORS** once a month with kerosene, gasoline, or prepared cleaner.
- **INSPECT AND CHECK GOVERNORS** each week when in continuous operation.
- **CHECK OIL LEVEL** every day in manually lubricated governors. SAE 20 is recommended at this time of year.
- **LINE UP** driving pulleys or gears accurately when reassembling governor after cleaning.

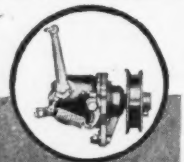
Should your governor need repair or reconditioning send it to the factory with the necessary preference rating certificate.

● Ripping up rails, imbedded for years in hard brick pavement, requires a lot of power all at once—and then, almost immediately, no power at all as the rail jerks free! It takes an accurate governor at the throttle, sensitive to every change in load, to provide exactly the amount of power that's needed automatically and instantaneously . . . and to shut it off in a split second to protect the motor against destructive over-speed!

That's why Pierce Flyball Governors have been so widely adopted as standard equipment! They not only give highly sensitive control of engine speed for efficient operation of equipment and protection of engines, but they bring you rugged, precision construction that assures long, dependable service under the toughest conditions.

THE PIERCE GOVERNOR CO., 1647 Ohio Avenue, Anderson, Indiana

NOW... and after the war... *insist* on Pierce Flyball Governors when you purchase new equipment.



Pierce Governors

STANDARD SINCE 1913

Hayward Buckets

Use this Class "E" Clam Shell Bucket for handling crushed stone, gravel, sand and other bulk materials.

THE HAYWARD CO., 48-50 Church St., N. Y.

"GUNITE"

can reduce your construction costs. It is efficient and dependable, an established product.

WE RECOMMEND "GUNITE" for structural steel protection, floor and roof slabs, thin exterior walls, partitions, tanks, reservoirs, restoring disintegrated concrete surfaces, repairing reinforced concrete, etc. Let us suggest how "Gunite" can best solve your problems.

PRESSURE CONCRETE CO.

"GUNITE" CONTRACTORS

6 Avenue B Newark, N. J.

struction of a Montana Army air base, has been transferred to Helena, Mont.

Samuel F. Stephens, formerly of the Staunton district office of the Virginia State Highway Department, has been named to succeed **Warwick C. Thomas** as senior engineer for the department. Mr. Thomas resigned recently to join the Civil Aeronautics Administration's engineering staff.

W. Irwin Short, associate professor of civil engineering at the University of Pittsburgh has been granted a leave of absence to join the Army Air Forces at Orlando, Fla., with the rank of captain.

John Beakey, traffic engineer for the Oregon State Highway Commission, has been granted a leave of absence to accept a commission as a captain in the Army Services of Supply. **Bruce Crandall,** assistant to Beakey, will fill his superior's post.

Lt. W. W. Studdert, USNR, who has been in charge of outside engineering on construction of a Marine Corps installation in North Carolina, has been promoted to the rank of lieutenant commander.

Two officers stationed at the U.S.E.D. office at Albuquerque, N. M., recently received promotions in rank. **Maj. Reuben E. Cole** became a lieutenant colonel, and **Capt. Paul A. Wilson** became a major.

G. Earl Lourie has resigned as superintendent of public works at Bristol, Vt.

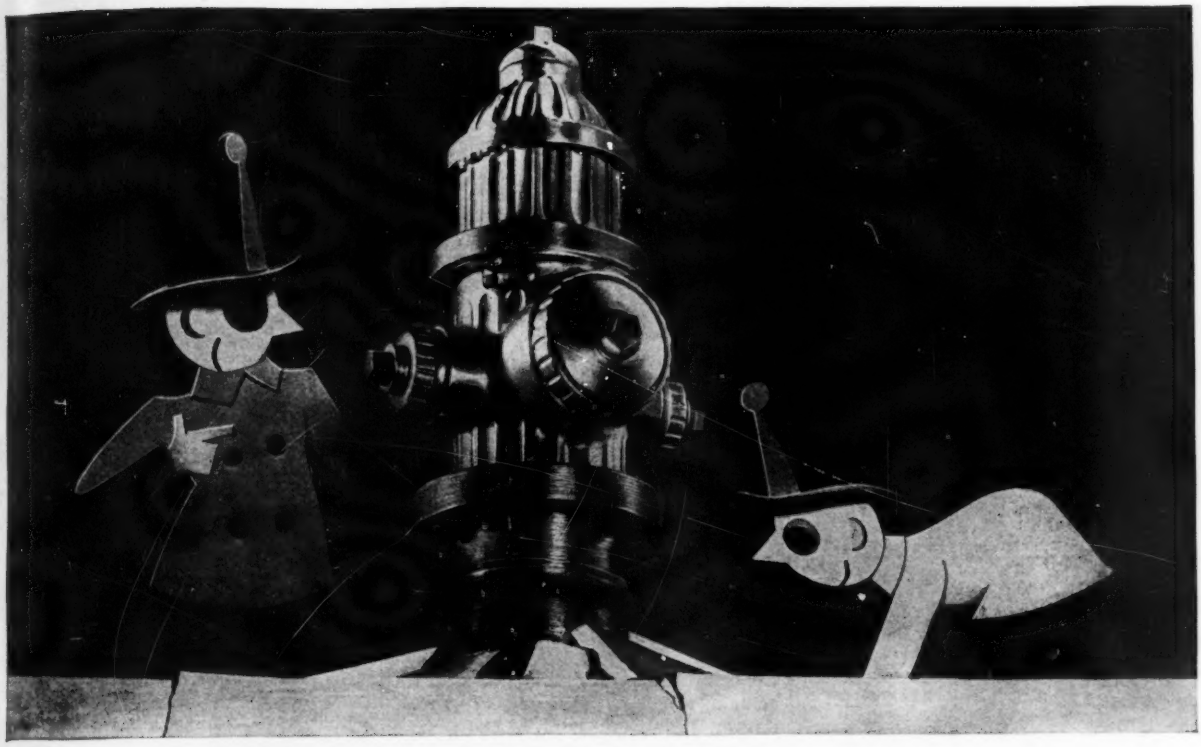
Warren A. Gallup, an employee of the Wyoming Highway Department for the past 14 years, and now manager of the state-wide planning survey, has been commissioned a first lieutenant in the Corps of Engineers.

Lt. Comdr. Richard De Charms, Jr., Naval officer in charge of construction at a North Carolina Marine Corps station, has been promoted to the rank of lieutenant commander.

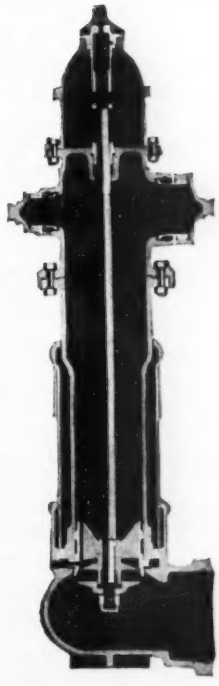
Fred S. Williamson, county engineer for Morris County, Kansas, has taken a leave of absence to do civil engineering work on a war project.

E. M. Duesenberg, retiring president of the Central Branch of the AGC, has returned to his home at Clear Lake, Ia., after employment on the Alcan Highway construction work.

C. C. Coykendall, who was assistant project manager for the Lytle-Green companies on the highway, has returned to Ames, Ia., where he is engineer of contracts and estimates for the Iowa State Highway Commission.



28" OF FROST IN THE GROUND
BUT OUR MATHEWS NEVER BUDGED



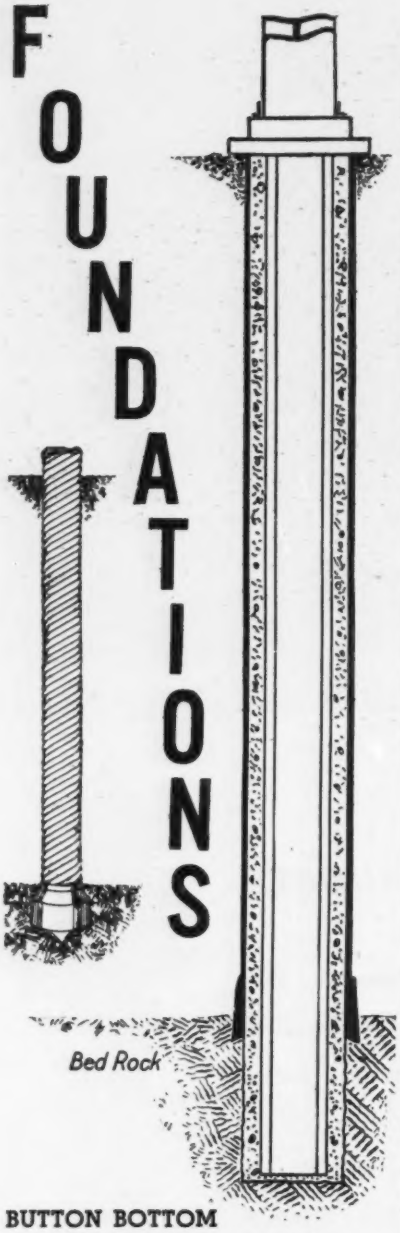
Everybody knows that ground swells when it freezes. But Mathews is the only hydrant designed to prevent that swelling ground from heaving the hydrant loose from its water main. The Mathews Hydrant has a loose protection case which is free to rise and fall without putting any strain on water carrying parts. If you face cracked or leaky hydrants this spring, investigate Mathews. This same protection case allows the barrel, containing all working parts, to be changed like a spare tire for repair, overhaul, or modernization.

MATHEWS HYDRANTS

Made by R.D. WOOD Company

400 CHESTNUT STREET, PHILADELPHIA, PA.

ESTABLISHED IN 1803



BUTTON BOTTOM
COMPOSITE—STEEL PILES
COMPRESSED CONCRETE
CAISSON PILES

DRILLED-IN CAISSONS

Engineers available for consultation on any foundation problem. Catalogues on request.

WESTERN

WESTERN FOUNDATION CO.
WESTERN CONCRETE PILE CORP.

308 W. Washington St. Chicago, Ill.
52 Vanderbilt Ave. New York, N. Y.

MEETINGS

ASSOCIATED EQUIPMENT DISTRIBUTORS, 24th annual meeting, Edgewater-Beach Hotel, Chicago, Ill., Jan. 11-13.

CANADIAN CONSTRUCTION ASSOCIATION, 25th annual convention. Import meeting. Seignory Club, near Montreal, Jan. 20-22.

AMERICAN SOCIETY OF CIVIL ENGINEERS, annual meeting, Society headquarters, New York, N. Y., Jan. 20-22, 1943.

AMERICAN CONCRETE INSTITUTE, 39th annual convention, Palmer House, Chicago, Ill., Feb. 17-18.

REGIONAL AND LOCAL MEETINGS

KANSAS CONTRACTORS ASSOCIATION, Kansas City, Mo., Jan. 7-8.

COLORADO SOCIETY OF ENGINEERS, 27th annual meeting, Shirley-Savoy Hotel, Denver, January 8th and 9th.

ASSOCIATED GENERAL CONTRACTORS OF MISSOURI, Kansas City, Mo., Jan. 20-21.

SOUTHWESTERN LUMBERMEN'S ASSOCIATION, "Victory Merchandising Clinic," Des Moines, Iowa, Feb. 4-5.

CONSTRUCTORS ASSOCIATION OF WESTERN PENNSYLVANIA, 9th annual meeting and dinner, William Penn Hotel, Pittsburgh, Pa., Feb. 4.

ASSOCIATION OF HIGHWAY OFFICIALS OF NORTH ATLANTIC STATES, Highway Problems Conference, Hotel Pennsylvania, New York, N. Y., Feb. 17-19, 1943.

Elections and Activities

MEMBERS of the Portland Society of Safety Engineers have elected R. A. Stanton, of the U. S. Army Engineers as chairman, succeeding Lt. Marrill D. Ely. T. W. Lowery is the new vice chairman, Miles Murray is secretary-treasurer, and F. W. Johnson, O. R. Hartwig, and George E. Post are on the executive committee.

POST-WAR PUBLIC works were the subject of discussion by Henry L. Howe, city engineer and deputy commissioner of public works of Rochester, N. Y., at a recent joint meeting of the Louisiana Engineering Society and the New Orleans Chapter, American Public Works Association. Mr. Howe, national president of the American Public Works As-

SPEED SPEED SPEED!

WITH VIBER **VIBRATION**

Viber Vibrators are being used on wartime construction because they mean better concrete faster! No matter what type of concrete work you do, there is a type of Viber Vibrator made for that type of work. Interchangeable equipment, for gas, electric and air-operation, still further reduces costs.

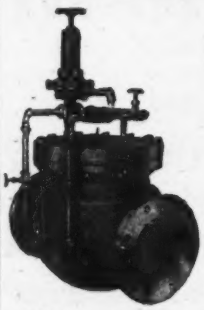
NEW FEATURES "GAS" VIBRATOR

Mercury clutch, entirely automatic, picks up load at 1500 r.p.m. allowing engine to idle without running vibrator, eliminates stalling, makes starting easy in cold weather.

Upsetting is practically eliminated in mounting. Handles allow complete unit to be easily carried.

• NEW CATALOG describing new line of modern Viber Vibrators sent on request. Write for it today.

VIBER COMPANY
726 SO. FLOWER STREET
BURBANK, CALIFORNIA



WATER PRESSURE RELIEF VALVE

★

Sizes: 3" to 36"
Angle and Globe Patterns

On excess pressure, due to line surges or excess pumping head, this valve automatically opens to dissipate necessary water volume to maintain desired line pressure. The valve is arranged either with atmospheric pilot valve exhaust or self-contained, according to service conditions and requirements.

Valves may be arranged to open at abnormal pressures and held open under subnormal pressures until the surge subsides, and then close when normal conditions prevail.

Write for Specifications

GOLDEN-ANDERSON VALVE SPECIALTY CO.
Fulton Building Pittsburgh, Pa.

Sauerman Scraper, operated by crane, digs basin 400 ft. wide for reservoir.

MOVE MORE YARDS FASTER FOR LESS MONEY

Where loose materials (such as sand, gravel, blasted rock, ore, etc.) must be dug, hauled, and dumped at ranges from 100 to 1500 ft. the economical way to do it is with a SAUERMAN Scraper or Slackline Cableway.

These efficient machines haul 10 to 1,000 tons of material per hour, require only one operator, and demand little in maintenance. SAUERMAN units have made low cost records on dig-and-haul jobs all over the world for 30 years.

Write for Catalog.

SAUERMAN BROS., INC.
532 S. Clinton St., Chicago

SAUERMAN
LONG RANGE MACHINES

Compact! Powerful! Safe!

DISTRIBUTABLE CONTROLLED POWER

with Beebe Bros. ALL STEEL HAND HOIST SEATTLE, U.S.A.

★

Money Has Been Saved on These Jobs

1200' assembled pipe (132 Tons) were lowered to bed of Mississippi at St. Paul with 9—5-Ton Beebes, three lines to each hoist through blocks.
Hudson River Bridge sidewalks were laid in sections with 32—5-Ton Beebes.
Longest wooden trusses in world were installed with ONE 5-Ton Beebe after power hoists proved impractical.

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sociation, is the inventor of several devices for sampling asphalt pavement and has been actively associated with the American Society for Testing Materials.

HARRY O. GARMAN, Indianapolis consulting engineer, and Prof. A. P. Poorman, head of the Purdue University department of applied mechanics, were honored with life memberships in the American Society of Civil Engineers at a recent joint meeting of the Indiana Section and the Purdue student chapter.

AN EXCHANGE of information and a pooling of experiences on current problems involved in their work was a feature of a two-day session of the Alabama section, American Society of Civil Engineers, held recently at Birmingham. Speakers included Maj. Harry W. Horewitz, Corps of Engineers; W. H. Garuthers, past president of the Alabama section; W. W. May, regional supervisor for the Alabama Polytechnic Institute engineering, science and management war training programs, and Comdr. John S. Leister, of Washington.

AT THE ANNUAL convention of the Northern California Chapter, Associated General Contractors of America, held in San Francisco Dec. 11-12, the program included a wide range of current topics from contract re-negotiation to gasoline and tire rationing. Brig. Gen. Warren T. Hannum, engineer, Pacific Division, U. S. Corps of Engineers, said the construction assignments given to the engineer department under the 1942 program, totaling some $8,000,000,000, are about 80 percent completed.

The prospect for 1943, he said, might be on the order of $2,000,000,000 if the complete budget is approved. Of this amount, several hundred millions might logically be expected to be allotted to West Coast undertakings.

California Governor-elect Earl Warren made a plea for giving thought now to post-war planning, emphasizing the part that the construction industry can play in this, and pointing out the advantages to be gained by bringing government, industry and citizens into a cooperative program for development on a long-term basis.

W. N. KELLY was recently elected chairman of the Vancouver, B. C., branch of the Engineering Institute of Canada. T. [illegible] Berry was named vice chairman and P. B. Stroyan secretary-treasurer. A. Peebles is branch news editor. Members of the executive committee are: J. P. Fraser, R. E. Potter, E. S. Jones, H. P. Archibald, I. C. Barltrop and H. J. McLeod. The Institute medal for the year was awarded to C. Gordon Rogers of the University of British Columbia.

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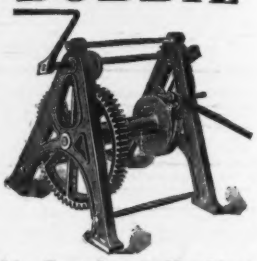

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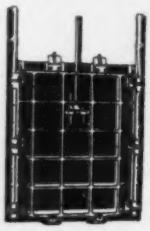

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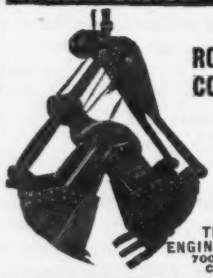

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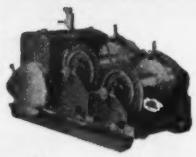

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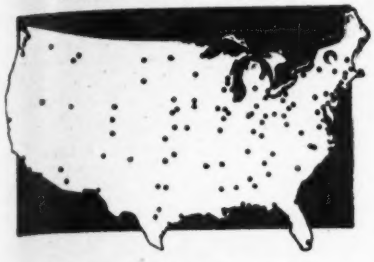
Location of ENR Correspondents



Symbols and Abbreviations Include

† Federal Government
★ Project of $500,000 or over
ENR Engineering News-Record
CD Engineering News-Record Construction Daily
A-E-M Architect — Engineer-Management type of contract.

Projects—By Size

Construction projects here reported cover the United States and Canada, are of these minimum sizes or larger; water supply, earthwork, waterworks, $15,000; other public works, $25,000; industrial buildings, $40,000; other buildings, $150,000.

Classes of Construction

(Named in order of Listing)

Water Supply	Unclassified
Sewers, Waste Disposal	Latin America
Bridges, Grade Cross'gs	Public Buildings
Streets & Roads	Commercial Buildings
Earthwork, Waterways	Industrial Buildings

Stages Reported

PROPOSED: (except Streets & Roads):

BIDS ASKED (new announcements only. For full calendar, see also preceding issues of ENR);

LOW BIDDERS: On jobs below $500,000 value all low bidder news will be the final reports published on the projects involved except where award is not made to the low bidder. In this case, a supplementary contract award report will be published.

CONTRACTS AWARDED: Except awards to low bidders previously reported in low bidder stage.

Dates shown are of issue in which last previous report was published.

Note: To comply with censorship requirements, addresses on some reports are being generalized. Data which would reveal the purpose of the improvements and the size are withheld. The name of contractor and general area are reported.

WATER SUPPLY

PROPOSED WORK

†Me., Kittery—City, Water Dpt., bids soon No. 2 pipe line and chlorination plant, Me. 17-109. Over $15,000. **FWA.** Whitman & Howard, 89 Broad St., Boston, Mass., engrs. CD 11/18—ENR 11/26.

Tex., Abilene — City, c/o W. W. Hair, mayor, water facilities addn. and 6,000 ft. transite 20 in. water pipeline connecting filter plant and supply line. $42,100. Applied to FWA. Freese & Nichols, Capps Bldg., Fort Worth, engrs.

★**†Tex., Houston**—City, c/o C. A. Pickett, mayor, water sys. imprvs., Tex. 41-564F. $700,000 addnl. **FWA** allot. CD 11/24—ENR 12/3, under CA.

N. S., Pictou—Municipality, imprv. pump. station, gas chlorination plant, 2 hypochlorination plants. R. Donald McKay, Dpt. Health, Halifax, engr.

BIDS ASKED

Bids Asked January 6

New York—Comr. Water Supply, Gas & Electricity, Municipal Bldg., addnl. support for existing 30 in. steel riser pipe in Cross Bay Parkway, near Beach Channel Bridge, Queens Boro.

Bids Asked in January

†Mo., Neosho — City, WW sys. $353,535. **FWA.** H. T. Lawrence, 3244 N.W. 14 St., Oklahoma City, Okla., engr. CD 4/7—ENR 4/9.

Bids Asked

†Pacific Northwest—U. S. Eng., 800 3 Ave., Seattle, Wash., water supply and distr. sys., Inv. 302.

LOW BIDDERS

†South Carolina—U. S. Eng., 33 Customhouse, Charleston, Dec. 11, water supply, Charleston Co., from Charleston Constructors, Inc., Adgers Wharf, Charleston.

†Texas—U. S. Eng., Fort Sam Houston, WW, sewers, etc., Bell Co., from S. F. Frank, Construction Bldg., Dallas, under **$50,000.**

CONTRACTS AWARDED

†California—U. S. Eng., 1209 8 St., Sacramento, water and sewerage sys., facilities, Stanislaus Co., to Pacific Pipe Line Constr. Co., Avenal, under **$50,000.**

†Florida—U. S. Eng., Court House, Jacksonville, WW supply and distr. sys., Inv.-Neg-Jax-43-397, Palm Beach Co., to Cleary Bros. Constr. Co., Georgia Ave., West Palm Beach, under **$50,000.** Awarded 12/3.

†Georgia — U. S. Eng., Post Office Bldg., Savannah, water distr. sys., Liberty Co., to Nichols Contg. Co., 1190 Carolina St. N.E., Atlanta, **$50,000-$100,000.**

†Georgia—U. S. Eng., Post Office Bldg., Savannah, water distr. and sanitary sewerage sys., Richmond Co., to Higgins & Gaines, Greensboro, N. C., under **$50,000.**

†Massachusetts — U. S. Eng., Park Square Bldg., Boston, water storage tower, Middlesex Co., to Horn Brothers, Inc., 23 Miner St., Boston. Est. under **$50,000.**

†Minn., St. Paul—City, W. A. Parranto, comr. Pub. Utilities, labor 6,450 lin. ft. 6-16-in. water pipeline, to B. S. Andrus, Richmond and Concord St., South St. Paul, **$21,449.** Total est. $50,000. City to furnish pipe. **FWA.** CD 10/7—ENR 10/15.

Mo., Kansas City—City, c/o A. Cookingham, City Hall, c.i. watermains, near 75 and Troost Sts., to Frank Flinn Const. Co., 92 and Holmes Sts. Est. **$49,800.**

†New Jersey—U. S. Eng., 120 Wall St., New York, N. Y., water and sewage facilities expansion, Essex Co., to Mahieu Constr. Co., Inc., 38 Wagaraw Ave., Paterson, N. J., under **$50,000.**

N. J., Barnegat City—Boro, 1 story, frame pump house, to Floyd L. Crammer, 133 5 Ave., Beach Haven, **$40,000.** Sherman & Sleeper, 501 Cooper St., Camden, engrs.

N. J., Point Pleasant—Boro, 1 story, brick pump. station, 600 ft. 8 in. c.i. watermains, deep well, separate contracts, **$19,814.** Electrical contract, to Westinghouse Electric & Mfg. Co., 3001 Walnut St., Phila., Pa., **$1,207.** H. O. Uhden, Railroad Sq., engr.

Okla., Elk City — Steel pipe line crossing North Fork Red River, to Sherman Iron Wks. Co., 18 E. Main St., Oklahoma City, **$36,491.** Est. $40,000. Bids 12/15. CD 12/7—ENR 12/17.

†Pennsylvania — U. S. Eng., Standard Oil Bldg., Baltimore, Md., filter center addn., alterations, to Herre Bros., 2250 N. 7 St., Harrisburg, under **$50,000;** target butt, to G. A. and F. M. Wagman, Dallastown, under **$50,000,** both Dauphin Co.

†South Carolina—U. S. Eng., Post Office, Savannah, Ga., water distr., sanitary sewers, electrical distr. sys., Greenwood Co., to Nichols Contg. Co., 1190 Caroline St. N.E., Atlanta, Ga., under **$50,000.**

†Texas—U. S. Eng., 231 W. Main St., Denison, water storage facilities, well houses, also sewage treatment plant, facilities, Smith Co., to R. E. McKee, 1918 Texas St., El Paso, **$100,000-$500,000.**

†Virginia—U. S. Eng., Court House, Norfolk, filter center addn., alterations, Henrico Co., to Claiborne & Taylor, Inc., 117 S. 2 St., Richmond, under **$50,000.**

Wis., Milwaukee—Crucible Steel Casting Co., 2850 S. 20 St., deep well for foundry bldg., to Layne-Northwest Co., 709 N. 11 St.

Que., St. Louis de Courville—Municipality, c/o L. P. Laplante, clk., concrete reservoir dam on River du Lus, to Poudrier & Boulet, Ltd., 55-18 St., Quebec City. Est. **$25,000.** Bids 11/25. C. Lassard, 35 Blvd. des Allies, Quebec City, engr.

SEWERS, WASTE DISPOSAL

PROPOSED WORK

Pa., Johnsonburg—Boro Council, treatment works to stop pollution Clarion River. Over $25,000.

Pa., Ridgway — Boro Council, treatment plant to end pollution, Clarion River. Over $25,000.

Pa., St. Marys — Boro Council, treatment works to end pollution, Clarion River. Over $25,000.

†R. I., Middleton (mail Newport)—Town, R. C. Adams, chn. Sewer Com., sanitary sewerage sys., West Main St. from West Main Rd. connecting with Anchorage Sys. $50,000. **FWA.** Jenks & Ballou, 2600 Industrial Trust Bldg., Providence, engrs.

Wis., Appleton—Consolidated Water Power & Paper Co., Wisconsin Rapids, waste disposal plant.

Wis., Beloit—A. D. Telfer, city mgr., storm sewers in 3 streets; 7 streets near new housing project. About $50,000. C. J. Popelka, city engr.

LOW BIDDERS

Calif., Los Angeles—Bd. Pub. Wks., Dec. 16, sanitary sewers Mammoth Ave. and Davana Terrace Sewer Dist., from Martin Constr. Co., 721 South Ford Blvd., **$93,890.** CD 11/30—ENR 12/3.

Calif., San Pablo—San Pablo Sanitary Dist., F. Carfield, secy., Firehouse, sewers in Assessment Dists. 15 and 17, from A. E. Downer, 1439 N. Baker St., Stockton, **$40,000** and **$84,000** respectively. CD 11/2—ENR 11/19.

CONTRACTS AWARDED

†Alabama—U. S. Eng., U. S. Courthouse & Customhouse, Mobile, drainage, Inv. 569-43-373, Mobile Co., to Hodgson Concrete & Asphalt Co., N. Perry St., Montgomery. Est. **$75,000.**

†Florida—U. S. Eng., U. S. Courthouse & Post Office, Jacksonville, sewage septic tank, Inv. NEG-JAX-43-439, Duval Co., to Concrete Products Co., 30 Riverside Ave., Jacksonville, less than **$50,000.**

†Florida — U. S. Eng., U. S. Courthouse & Post Office, Jacksonille, drainage appurtenances, Inv. NEG-JMA-43-9, Duval Co., to Murphy Constr. Co., Clare Ave., West Palm Beach, less than **$50,000.**

†Florida—U. S. Eng., U. S. Courthouse & Post Office, Jacksonville, sewage and water connections, Inv. NEG-BR-43-14, Palm Beach Co., to Murphy Constr. Co., Clare Ave., West Palm Beach, less than **$50,000.**

N. J., Bloomingdale—Boro, Hamburgh Turnpike, sanitary sewer Van Dam Ave., to Cestone & Fastiggi, 473-15 Ave., Newark. Schilling & Spinnler, 115 Market St., Paterson, engrs.

†Texas—U. S. Eng., Fort Sam Houston, sewage disposal plant, Spec. 42-564, Bexar Co., to R. E. Ewing, 140 Sheridan Dr., San Antonio, under **$50,000.**

†Washington—U. S. Eng., 800 3 Ave., Seattle, sewer facilities, water sys. and electrical distr. sys., King Co., to Thompson Plumbing & Heating Co., 612 American Bldg., Seattle, under **$50,000.**

BRIDGES, GRADE CROSSINGS

LOW BIDDERS

Calif., Long Beach—Bd. Harbor Comrs., Dec. 18, 600 ft. bridge over Flood Control Channel, Ocean Blvd., for City Harbor Dpt., 1333 El Embarcadero St., and Los Angeles County (Los Angeles), from Modern Builders Constr. Co., 2812 Long Beach Blvd., **$124,319.** Est. $85,000. CD 12/2—ENR 12/10.

Calif., San Francisco — Dpt. P. Wks., City Hall, Dec. 16, repairing 3rd St. bridge, new timber over Channel St. waterway, decks. Contr. 7, spec. 19715, from Eaton & Smith, 715 Ocean Ave., **$28,267.** CD 12/8—ENR 12/10.

Pennsylvania—I. Lamont, secy. Hys., Harrisburg, Dec. 21, repairing Hickory St. Bridge pier fdns., Warren Co., from H. T. Osburn & Co., Franklin, **$83,440.** CD 12/8—ENR 12/10.

Texas—D. C. Greer, engr. State Hy. Dpt., Austin, Dec. 15, Leon River Bridge, Bell Co., from C. H. Harrison, Box 185, Waco, **$122,253.** Est. $125,000. CD 12/4.

Que., St. Jean Baptiste de Rouville—Municipality, c/o L. Blanchard, clk., bridge over Huron River. $25,000. Dpt. P. Wks., Quebec City, engrs

CONTRACTS AWARDED

Montana—State Hy. Comn., Helena, temporary untreated timber bridge, Stillwater Co., to W. Mackin, 1145 N. 30 St. Billings, **$35,954.** Bids 12/18. CD 12/17.

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STREETS AND ROADS

LOW BIDDERS

Calif., Burbank—Asphaltic concrete paving Victory Blvd. from city limits to Burbank Blvd., from T. E. Sherlock, 1103 W. 40 Pl., Los Angeles, **$48,833.** H. I. Stites, city mgr.

Connecticut—State, W. J. Cox, hwy. comr., Hartford, imprv. 8,600 ft. roads, Windsor and Windsor Locks, from Rome Constr. Co., Holden, Mass., **$42,897.** CD 12/12—ENR 12/24.

D. C., Wash. — District Comrs., District Bldg., Dec. 21, concrete mixture, bituminous, 5,000 tons, from McGuire & Rolfe, Inc., I and O Sts. S.E., **$27,250.**

Georgia—W. E. Wilburn, chn. State Hy. Dpt., Atlanta, Dec. 18, imprv. 6.432 mi. Lowndes Co., from R. H. Wright & Son, 1st Natl. Bank Bldg., Columbus, **$224,810***5.113 mi. Fayette Co., from Pittman Constr. Co., 537 Plaster Rd., Atlanta, **$180,958***0.511 mi. Chatham Co., from Espy Paving & Constr. Co., 108 E. Bay St., Savannah, **$24,939.** CD 12/16.

Oregon—State Hy. Comn., Salem, Dec. 18, imprv. 8.3 mi. and 2.65 mi., Jackson Co., from Tru-Mix Concrete Co., Medford, **$133,416** and **$49,025** respectively; flight strip, Morrow Co., from J. C. Compton & E. C. Hall, Eugene, **$200,785.** Received no bids two rock projects in Kalmath Falls, one each in Wallowa, Lane and Baker Counties. Will readvertise. CD 12/18—ENR 12/10.

Pennsylvania—I. Lamont, secy. Hys., Harrisburg, Dec. 21, imprv. 2,477 ft. Wayne Co., from C. W. Wagner & Son, Plymouth. Schedules **(1) $94,463 (2) $95,343***475 ft. Wayne Co., from Harvey & Flory, East Stroudsburg, **(1) $69,342 (2) $69,772***4,255 ft. Wayne Co., from Reed & Kuhn, Elysburg, **(1) $160,165 (2) $161,986.** CD 12/8—ENR 12/10.

Tennessee—State Hy. Dpt., Nashville, Dec. 18, imprv. 5.255 mi. Hamilton Co., from Geo. O. White, 1301 Market St., Chattanooga, **$239,278***0.218 mi. Shelby Co., from Lehman-Roberts Co., 575 N. Front St., Memphis, **$49,916***1.116 mi. Shelby Co., from Bowyer & Johnson, Jackson, **$73,820.** CD 12/8—ENR 12/10.

★**Texas**—D. C. Greer, engr. State Hy. Dpt., Austin, Dec. 15, from L. H. Lacy Co., 3009 N. Henderson St., Dallas, imprv. 5.677 mi. Potter Co., **$165,890,** est. $170,000; 12.682 mi. Wood and Smith and Smith and Gregg Counties, **$476,252,** est. $475,000; 6.117 mi. Wood and Smith Counties **$206,098,** est. $200,000***from Ernest Loyd, Box 1077 Fort Worth, 8.693 mi. Gillespie Co. **$73,080,** est. $80,000***from Geo. Kies, Inc., 1700 Pease Rd., Austin, 7.565 mi. Smith and Gregg Counties **$289,642,** est. $280,000; 6.972 mi. Gonzales Co. **$272,091,** est. $250,000. CD 12/4.

★**Virginia**—Dpt. Hys., Richmond, Dec. 22, imprv. 13.76 mi. Warwick, James City and York Counties, from W. H. Scott, Inc., Franklin, **$1,257,737;** 2.2 mi. Arlington Co., from Blackwell Eng. & Constr. Co., Warrenton, **$32,744.** CD 12/10 and 12/14—ENR 12/17.

CONTRACTS AWARDED

†**Florida**—U. S. Eng., Court House, Jacksonville, roads, installing ducts, Inv.-Neg.-FM-43-19, to J. L. Cone & J. D. Manly, Caesar Ave. and Cumberland Rd., Tampa, under **$500,000,** awarded 12/3; electrical distr. sys., Inv. Neg. Jax-43-393, to Electric Co., Sarasota, under **$50,000,** awarded 12/4, both Collier Co.

†**Florida**—U. S. Eng., Court House, Jacksonville, clearing, grubbing, grading, paving roads, Inv. Neg-Jax 43-409, to Hubbard Constr. Co., Orlando, under **$50,000,** awarded 12/5***electric distr. sys., Inv. Neg. Jax 43-365, to Hine Electric Co., 376 S. Country Rd., Palm Beach, under **$50,000***electric distr. sys., Neg. Jax 43-418, to Brandon Electric Co., Deland, under **$100,000,** both awarded 12/4, all foregoing Orange Co.

†**Florida**—U. S. Eng., U. S. Courthouse & Post Office, Jacksonville, grading, paving, and bldg. addn. Inv. NEG-JAX-43-431, Dixie Co., to Wainer Constr. Co., Valdosta, Ga., less than **$100,000.**

†**Kansas**—U. S. Eng., 416 Wright Bldg., Tulsa, Okla., roads, Cowley Co., to M. W. Watson, Natl. Bank of Topeka Bldg., Topeka, est. under **$50,000.**

†**Louisiana**—U. S. Eng., 25 St. and Avenue F, Galveston, Tex., roads and training aids, Inv. W. 359-43 (N. O. Area 1), to Boh Bros. Constr. Co., 2400 Cypress St., New Orleans. Awarded 12/15.

†**Maryland**—U. S. Eng., Standard Oil Bldg., Baltimore, roads, walks, paving areas and drainage structures, Harford Co., to C. J. Langenfelder & Son, 908 S. Wolfe St., Baltimore, **$50,000-$100,000.**

North Dakota—State Hy. Dpt., Bismarck, imprv. 7.5 mi. Grand Forks Co., to Anderson Bros., Thief River Falls, Minn., **$117,048;** structural road imprv., Grand Forks Co., to Rue Constr. Co., Bismarck, **$35,734.** Bids 12/18. CD 12/8—ENR 12/10.

Oregon—State Hy., Comn., Salem, Nye Jct.-Grant Co. line State Rock Production Project

STREETS (Contracts Awarded, Cont'd.)

on Pendleton-John Day Hy., Umatilla Co., to O. C. Yocom, McMinnville, **$71,115.** Bids 12/15.

†**Texas**—U. S. Eng., Fort Sam Houston, walks, etc., Bell Co., to Central Contg. Co., Constr. Bldg., Dallas, under **$50,000.**

†**Washington**—U. S. Eng., 800 3 Ave., Seattle, paving Pierce Co., to Washington Asphalt Co., 209 W. 39 St., Seattle, **$50,000-$100,000.**

EARTHWORK. WATERWAYS

PROPOSED WORK

★**New Jersey**—State Dpt. Conservation & Development, State House, Trenton, rehabilitating Delaware and Raritan Canal, reconstructing dam repairs, spillways, bridges to provide recreational areas, industrial water supply. Middlesex, Mercer and Somerset Counties. **$500,000.**

Wisconsin—Wisconsin Valley Improvement Co., 404 3 St., Wausau, enlarging, raising dam Spirit River, Lincoln Co.

LOW BIDDERS

†**Louisiana**—U. S. Eng., foot of Prytania St., New Orleans, Dec. 12, 150,000 cu. yd. earthwork, Inv. 213, Red River Levee Dist., from Dameron & Kenyon, Port Allen. CD 12/8.

N. Y., Port Jefferson—Town of Brookhaven, Town Bd. Patchogue, bulkhead fill, drainage structures, Port Jefferson Harbor, near Surf Ave., from South Shore Contr. & Dredging Co., 100 West Ave., Patchogue.

CONTRACTS AWARDED

†**Tex., Orange**—A. Sokolski, mayor, dikes and drainage imprvs., Tex. 41-318, to Streator Dredging Co., Beaumont, **$68,000.** Est. $68,928. C. Smith, Bancroft Bldg., engr. **FWA.**

UNCLASSIFIED

PROPOSED WORK

†**Florida**—IMPROVEMENTS—Huckins Yacht Corp., 600 E. 4 St., imprvs. addnl. facilities. Federally financed.

Louisiana — CASINGS — The Superior Oil Co., Oil & Gas Bldg., Houston, Tex., 3 in casings (pipes), stakes, etc., Terrebonne Parish.

La., Mermentau—GAS PIPE LINE—Falcon Seaboard Drilling Co., Philtower Bldg., Tulsa, Okla., 3 in. gas pipe line, Acadia Parish.

La., Shreveport—OIL WELL—H. L. Hunt & Associates, City Bank Bldg., developing oil field deep test oil well.

Minn., Austin — IMPROVEMENTS—Expansion imprvs. Over $25,000. A. Hansen, city engr.

Minn., New Ulm—IMPROVEMENTS—$65,000 bond election Jan. 18, imprvs. CD 12/1—ENR 12/3.

Miss., Cleveland — IMPROVEMENTS—City, Mrs. C. S. McLemore, mayor, imprvs. $400,000. E. L. Woolf, Cleveland, engr.

†**Nebraska**—UTILITY YARD, etc.—U. S. Eng., 1709 Jackson St., Omaha, Neb., utility yard, grease racks and repair shop, Scottsbluff Co. Under $50,000.

★†**Nebraska**—IMPROVEMENTS—U. S. Eng., 1709 Jackson St., Omaha, imprvs. Knox Co. Over $1,000,000.

BIDS ASKED

Bids Asked January 5

New York — TEST BORINGS — Comr. Parks, at Office Dpt. Parks, Arsenal Bldg., Central Park, 64 St. and 5 Ave., New York, test borings for proposed structures in Sound View Park, Contr. X-118-142, Bronx Boro.

Bids Asked January 7

†**Texas**—IMPROVEMENTS—U. S. Eng., 25 St. and Avenue F, Galveston, completing imprvs., Docket 42-43-904-41-44, Jefferson Co. Plans deposit $25.

Bids Asked

†**Texas**—GAS LINES, etc.—U. S. Eng., Fort Sam Houston, underground utilities, gas lines, $300,000; outside electrical distr. sys. extens. over $25,000 both Bell Co. Plans deposit $50 each project.

CONTRACTS AWARDED

†**California** — ELECTRICAL BLACKOUT — U. S Eng., 74 New Montgomery St., San Francisco, electrical blackout, San Luis Obispo Co., to T. L. Rosenberg Co., 372 5 St., Oakland. Awarded 12/16.

†**California** — ELECTRIC DISTRIBUTION SYSTEM—U. S. Eng., 1209 8 St., Sacramento, electrical distr. sys., appurtenant facilities, Solano Co., to Drury Electric Co., Bakersfield, under **$50,000.**

†**California**—FENCING—U. S. Eng., 74 New Montgomery St., San Francisco, boundary and area fencing, San Mateo Co., to Geo. Arthur & Sons, 941 S. Claremont St., San Mateo. Awarded 12/17.

†**California**—GASOLINE FUELING SYSTEM—U. S. Eng., 1209 8 St., Sacramento, gasoline fueling sys., Solano Co., to Kruly & Van Valkenburgh, Sacramento, **$50,000-$100,000.**

†**California**—PLATFORMS, etc.—U. S. Eng., 74 New Montgomery St., San Francisco, platforms on piers, San Francisco Co., to A. M. Hardy, 736 Clementina St., San Francisco. Awarded 12/17.

†**Colorado** — ELECTRICAL DISTRIBUTION SYSTEM—Pub. Housing Auth., NHA, Dierks Bldg., Kansas City, Mo., electrical distr. sys. and other utilities for trailer housing, to A. C. Larson, 2471 Arapahoe St., Denver, under **$50,000.**

†**Florida**—ELECTRIC DISTRIBUTION—U. S. Eng., U. S. Courthouse & Post Office, Jacksonville, electric distr. for a.c. gas storage sys., Inv. NEG-BA-43-11, Monroe Co., to J. R. Hime Electric Co., 376 S. Country Rd., Palm Beach, less than **$50,000.**

†**Florida** — FENCES — U. S. Eng., Court House, Jacksonville, fences, appurtenances, Inv. Neg. J.M.A. 43-7, Duval Co., to C. J. Keys, Federal Bldg., St. Petersburg, under **$50,000.** Awarded 12/4.

†**Florida** — FENCES — U. S. Eng., Court House, Jacksonville, fences, Inv. Neg. V.E. 43-10, Sarasota Co., to Krusen Land & Timber Co., Zepherhills, under **$50,000.** Awarded 12/3.

†**Florida**—GASOLINE STORAGE, etc.—U. S. Eng., Court House, Jacksonville, gasoline storage and fueling sys., Inv. Neg-Jax-43-390, Highlands Co., to Gabel-Rosa Co., 437 W. Bay St., Jacksonville, under **$100,000.** Awarded 12/2.

†**Florida**—GASOLINE STORAGE, etc.—U. S. Eng., U. S. Courthouse & Post Office, Jacksonville, gasoline storage and fueling sys., Inv. NEG-JAX-43-408, Lake Co. to C. J. Keys, First Federal Bldg., St. Petersburg, less than **$50,000.**

†**Florida**—GASOLINE STORAGE, etc.—U. S. Eng., U. S. Courthouse & Post Office, Jacksonville, gasoline storage and fueling sys., Inv. NEG-JAX-43-407, Levy Co., to Ryan Constr. Co., Stovall Bldg., Tampa, less than **$50,000.**

†**Florida** — IMPROVEMENTS — U. S. Eng., U. S. Courthouse & Post Office, Jacksonville, imprvs., Inv. NEG-JAX-43-415, Dade Co., to Polk Constr. Co., Lakeland, less than **$500,000.**

†**Florida**—SEEDING, etc.—U. S. Eng., Court House, Jacksonville, seeding and sprigging, Inv. Neg. Jax. 43-410, Dixie Co., to Island Landscaping Co., 309 S. Country Rd., Palm Beach, under **$50,000.** Awarded 12/2.

†**Florida** — SEEDING — U. S. Eng., Court House, Jacksonville, seeding, sprigging, Inv. Neg.-L.G.-43-3, Osceola Co., to Florida Nursery & Landscaping Co., Leesburg, under **$50,000.** Awarded 12/4.

†**Florida**—SEEDING, etc.—U. S. Eng., U. S. Courthouse & Post Office, Jacksonville, seeding, sprigging, Inv. NEG-JAX-43-413, Polk Co., to Florida Nursery & Landscape Co., Leesburg, under **$50,000.**

†**Maryland**—IMPROVEMENTS—U. S. Eng., Standard Oil Bldg., Baltimore, imprvs. and drainage sys., Baltimore Co., to James Gibbons Co., Relay, under **$50,000.**

★†**Michigan**—IMPROVEMENTS—U. S. Eng., 700 Union Guardian Bldg., Detroit, Mich., imprvs., Chippewa Co., to Spencer, White & Prentis Inc., 10 E. 40 St., New York, N. Y. Est. **$1,000,000.**

†**Mississippi**—IMPROVEMENTS—U. S. Eng., Court House, Mobile, Ala., imprvs., Lowndes Co., to Newton & Glenn, Hattiesburg, **$50,000-$100,000.**

★†**Missouri**—IMPROVEMENTS—Civil Aeronautics Admin., City Hall, Kansas City, Mo., imprvs., grading, etc., Proposal 543-P-80, Schedules 1 and 2, to Koss Constr. Co., 205 Old Colony Bldg., Des Moines, Ia. Est. **$2,000,000.**

★†**N. Y., Newburgh** — FLOATING DRY DOCK, etc.—Yards & Docks, Navy Dpt., 18 St. and Constitution Ave. N.W., Wash., D. C., 1 military type floating piece steel floating dry dock, NOY 5319, and 1 military type, 3 piece steel floating dry dock, NOY 5317, to Chicago Bridge & Iron Co., 1305 W. 105 St., Chicago, Ill., **$3,440,000** and **$2,840,000** respectively.

†**North Carolina**—IMPROVEMENTS—U. S. Eng., 308 Customhouse, Wilmington, imprvs., paving, etc., New Hanover Co., to F. D. Cline, Fairview Rd., Raleigh. Bids 12/7. Metcalf & Eddy, 1300 Statler Bldg., Boston, Mass., engrs.

★†**Rhode Island** — ADDITIONAL FACILITIES—Yards & Docks, Navy Dpt., 18 St. and Constitution Ave. N.W., Wash., D. C., addnl. facilities at advance base depot, Supplementary Agreement 9, NOY 4175, to George A. Fuller Co., and Merritt-Chapman & Scott Corp., 597 Madison Ave., New York, N. Y., **$18,478,000.** Additional to CD 11/17—ENR 11/19, under CA.

★†**Tennessee** — IMPROVEMENTS — U. S. Eng., 494 Spring St. N.W., Atlanta, Ga., imprvs., Davidson Co., to Wolfe-Michael Co., 1021 Heywood St., Memphis, under **$1,000,000.**

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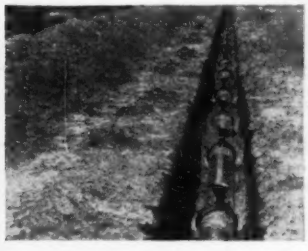

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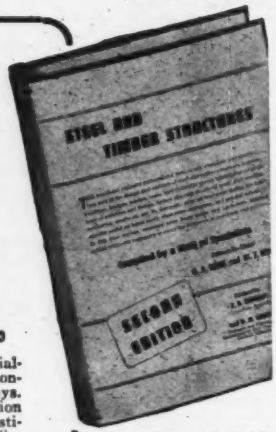

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UNCLASSIFIED (Contracts Awarded Cont'd.)

†Texas—IMPROVEMENTS—Todd Dry Dock & Shipbuilding Co., Pelican Spit, Galveston, imprvs., separate contracts. Federally financed.

†Texas — ELECTRICAL DISTRIBUTION SYSTEM, etc.—U. S. Eng., Fort Sam Houston, electrical distr. sys. and underground utilities, Bexar Co., to Myer & Wentworth, Rm. 5, Box 158, San Antonio, under **$50,000.**

†Texas — OIL STORAGE HOUSES — U. S. Eng., Fort Sam Houston, oil storage houses, Bexar Co., to H. A. Miller & Son, Terrell Wells, under **$50,000.**

Tex., Luling—OIL WELL—M. W. Elser & Associates, Milam Bldg., San Antonio, drilling, casing, developing 3,400 ft. deep test oil well, Darst Creek location, to Bennett & Davenport, Prairie Lee and Luling. Est. over **$25,000.**

Tex., Pecos—OIL WELL—C. W. Brown & Associates, McCamey, developing 2,500 ft. oil well, Sect. 15, Blk. 20, force account, **$30,000.**

★**†Va., Norfolk** — DRY DOCK — Yards & Docks, Navy Dpt., 18 St. and Constitution Ave. N.W., Wash., D. C., floating dry dock, NOY 5323, to Tidewater Constr. Corp., 547 Front St., **$1,400,000.**

★**†Washington** — IMPROVEMENTS — Civil Aeronautics Admin., 7 Regional Office, Boeing Field, Seattle, imprvs., to Minnis & Moody, Johnson, Inc., and Vista Constr. & Finance Co., P. O. Box 781, San Bernardino, Calif., **$2,418,744.** Bids 10/23. CD 10/26—ENR 10/29 under LB.

†Washington — WATCH TOWER — U. S. Eng., 800 3 Ave., Seattle, watch tower, Snohomish Co., to Washington Lumber Co., 3447 4 Ave. S., Seattle, under **$50,000.**

★**†Wash., Seattle** — DRY DOCK — Yards & Docks, Navy Dpt., 18 St. and Constitution Ave. N.W., Wash., D. C., 1 timber floating dry dock, NOY 5651, to General Constr. Co., 3840 Iowa St., **$770,000.**

LATIN AMERICA

Central America, El Salvador—Republic of El Salvador, c/o J. Frederico Mejia, pres. National Electrical Comn., San Salvador, plans hydro-electric plant on Lempa River.

Mexico, Nuevo Leon—State of Nuevo Leon, c/o Mexican Federal Govt., Mexico City, E. F. Suarez, secy., plans new highway, grading, embankments, base course and surfacing, etc., for 1943. $1,600,000. Eng. Branch, Dpt. P. Wks. & Communications, Mexico City, engr.

Mexico, Nueva Laredo—Mexican Federal Govt., Dpt. P. Wks. & Communications, Mexico City, plans constructing dike along Rio Grande River for 3 mi., 100 ft. deep.

South America, Chile—Government of Chile, Santiago, plans enlarging and rebuilding port of Valparaiso also erecting warehouses.

PUBLIC BUILDINGS

PROPOSED WORK

†Ala., Mobile—Federal Works Agency, Candler Bldg., Atlanta, Ga., bids soon school, Pritchard Dist. $300,000.

★**†Ariz., Morenci**—Pub. Housing Auth. NHA, 785 Market St., San Francisco, Calif., 230 houses.

†California—Marin County Housing Auth., G. Ciocca, exec.-dir., Cheda Bldg., San Rafael, plans by F. H. Meyer, Kohl Bldg., and R. I. Stringham, 525 Market St., San Francisco, public trailer camp, Cal. 4314, for NHA.

†California—Napa Housing Auth., Chamber of Commerce Bldg., Napa, plans by R. Guerne de Lappe, 564 Market St., San Francisco, dwelling units, Cal. 4282, and dormitories, Cal. 4283, for NHA. CD 7/7—ENR 7/30.

†California—Pub. Housing Auth., NHA, 785 Market St., San Francisco, war dwellings, Calif. 4601.

†Calif., Livermore—Pub. Housing Auth., NHA, 785 Market St., San Francisco, 40 houses.

†Calif., Napa — Napa Union High School Dist., plans by W. G. Corlett, 1801 Bank of America Bldg., Oakland, 16 classroom addns. $100,000. Federally financed.

†Calif., Richmond — Richmond Elementary School Dist., W. T. Helms, supt., 1108 Bissel Ave., plans by Dragon & Schmidts, 2068 Allston Way, Berkeley, 34 temporary classrooms, at various schools. $128,620. Federally financed.

†Calif., Riverbank — Pub. Housing Auth., NHA, 785 Market St., San Francisco, 150 unit housing, Cal. 4481. CD 12/8—ENR 12/10.

†Connecticut—Bridgeport Housing Auth., 252 Hallett St., Bridgeport, plans by H. G. Lindsay, 211 State St., Bridgeport, housing, Yellow Mill Village, for NHA.

†Conn., East Hartford (br Hartford)—Federal Works Agency, 99 Chauncey St., Boston, Mass., rejected bids Nov. 30, school addn., Forbes and Hill St., Mayberry Village, Conn. 6-166. $110,000. R. F. Barker, 17 Staples Pl., archt. CD 11/19.

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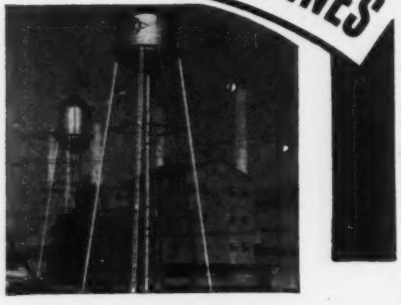

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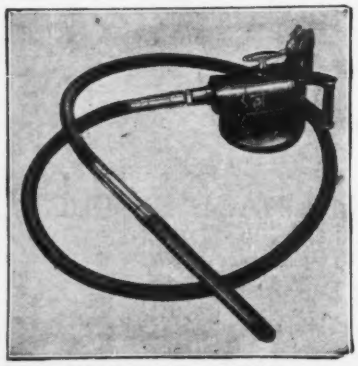

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PUBLIC BLDGS. (Proposed Work Cont'd.)

★†**Del., Newcastle**—Pub. Housing Auth., NHA, Temporary Bldg. 2, 19 and D Sts. N.W., Wash., D. C., 1,700 unit housing.

★†**Georgia**—Pub. Housing Auth., NHA, Georgia Savings Bank Bldg., Peachtree and Broad Sts., Atlanta, apartments and houses, $727,500.

†**Ill., Decatur**—Decatur and Macon Counties Hospital, C. C. Nicholson, pres., new brick, concrete wing, $242,000. **FWA** allot.

†**Ia., Davenport**—Mercy Hospital, 1326 W. Lombard St., hospital extens., equip., Iowa 13-134. $215,500. **FWA** allot.

★**Kan., Wichita**—Bd. Educ., L. Gerties, secy. Bd., plans by Overand & Boucher, Wichita, high school, $394,000 and 4 schools $535,800. Seeking FWA funds.

†**Me., Presque Isle**—Pub. Housing Auth., NHA, 24 School St., Boston, Mass., 36 unit housing, Me. 17053; 30 two-person family units, Me. 17054 and 64 unit dormitory housing, Me. 17056.

†**Md., Riverdale**—Pub. Housing Auth., NHA, Temporary Bldg. 2, 19 and D Sts. N.W., Wash., D. C., 80 unit temporary dwellings, Md. 18211. Transferred from Md. 18221. CD 11/13—ENR 11/19, under Bethesda.

†**Mass., Boston**—Federal Works Agency, 2 Lafayette St., New York, N. Y., plans by G. L. Bilderbeck, Groton, school.

†**N. C., New Bern**—Federal Works Agency, 606 State Planters Bank Bldg., Richmond, Va., sketches by R. Fuson, New Bern, brick, cinder block addn. St. Lukes Hospital. $210,000 allot.

†**Okla., Pryor**—G. A. Godrey, pres. Bd. Educ., plans by J. R. Koberling, 1400 South Boston Ave., Tulsa, school, Okla. 34-159. $491,000. **FWA.**

†**Pennsylvania**—Pub. Housing Auth., NHA, 270 Bway., New York, N. Y., plans by P. T. Farrell, 309 4 Ave., Pittsburgh, and bids soon, housing, Pa. 36352. $400,000. CD 10/14—ENR 10/29.

†**Pa., East Pittsburgh**—Pub. Housing Auth., NHA, 270 Bway., New York, N. Y., 150 unit temporary (instead of permanent) housing, Pa-36109. CD 12/3—ENR 12/10.

†**Pa., Greenville**—Federal Works Agency, 2 Lafayette St., New York, N. Y., recreation bldg. $90,000.

†**R. I., Providence**—Federal Works Agency, 99 Chauncy St., Boston, Mass., brick hospital $175,000.

†**R. I., Providence**—Miriam Hospital, 31 Parade St., altering hospital, RI 37-144. $30,000. **FWA.** Will not construct new bldg. as planned. Barker & Turoff, 1022 Grosvenor Bldg., Providence, archts. CD 10/27—ENR 10/29.

★†**South Dakota**—Metal Reserve Co., 811 Vermont Ave. N.W., Wash., D. C., plant, $800,000. Industrial Company will operate.

†**Texas**—Pub. Housing Auth., NHA, 1309 Electric Bldg., Fort Worth, bldgs., facilities. $150,000 or more.

†**Tex., Corpus Christi**—State Bd. Health, Austin, plans by Hamon & Co., 715 Cancahua St., Corpus Christi, detention clinic, facilities. $60,000 **FWA** allot.

Tex., Houston—Houston Ind. School Dist., Garden Oaks, relief school, Garden Oaks Addn.

†**Tex., Orange**—Bd. Educ., Orange, plans by C. H. Page & Son, P. O. Box 903, Austin, school, Tex. 41-503. $260,600. **FWA.** CD 12/14—ENR 12/17.

†**Utah**—Pub. Housing Auth., NHA, Dierks Bldg., 10 St. and Grand Ave., Kansas City, Mo., houses. $400,000.

†**Utah**—Pub. Housing Auth., Dierks Bldg., 10 St. and Grand Ave., Kansas City, Mo., plans by C. S. Ashmouth, Provo, 200 trailers. $150,000.

★†**Utah**—Pub. Housing Auth., NHA, Dierks Bldg., 10 St. and Grand Ave., Kansas City, Mo., houses. $600,000.

†**Utah, Garfield**—Pub. Housing Auth., NHA, Dierks Bldg., 10 St. and Grand Ave., Kansas City, Mo., 134 houses.

†**Utah, Lark**—Pub. Housing Auth., NHA, Dierks Bldg., 10 St. and Grand Ave., Kansas City, Mo., 50 houses.

★†**Va., Hampton Roads**—Pub. Housing Auth., NHA, Temporary Bldg 2, 19 and D Sts. N.W., Wash., D. C., housing.

★†**Wash., Bremerton**—School Bd., rejected bids Oct. 15, high school. $600,000. **FWA.** Will readvertise. Naramore & Brady, Dexter Horton Bldg., Seattle, archts. CD 10/21—ENR 10/29, under LB.

★†**West Virginia**—Defense Plant Corp., 811 Vermont Ave., plans by K. G. Paxton, Martins Ferry, O., factory. $500,000. Industrial Company will operate.

BIDS ASKED

Bids Asked After January 1

★†**D. C., Wash.**—Alley Dwelling Auth., 1737 L St. N.W., 200 unit demountable housing, DC-49060, for NHA. Extended date. CD 12/1—ENR 12/5.

Bids Asked January 4

†**N. Y., North Tonawanda**—Federal Works Agency, 2 Lafayette St., New York, 1 story, bsmnt., addn. to main bldg. and 2 story, bsmnt. addn. to maternity section, De Graff Memorial Hospital, $236,000. F. J. and W. J. Kidd, 524 Franklin St., Buffalo, archts. CD 10/29—ENR 11/5.

PUBLIC BLDGS. (Bids Asked, Cont'd.)

Bids Asked January 5

†**N. Y., Geneva** — Federal Works Agency, 7 Lafayette St., New York, altering Geneva General Hospital. $82,000. CD 3/11—ENR 2/19.

Bids Asked January 9

★†**Utah**—Pub. Housing Auth., NHA, Dierks Bldg., Kansas City, Mo., frame housing. $500,000. Extended date. Burns & McDonnell, 107 W. Linwood Blvd., Kansas City, Mo., archts. CD 12/16—ENR 12/10.

Bids Asked

★†**California**—Oakland City Housing Auth., 935 Union St., Oakland, housing units, Cal. 4115, for NHA. J. J. Donovan, 950 Parker St., Berkeley, archt.

★†**California** — Richmond Housing Auth., Administration Bldg., Atchison Village, Richmond, housing, Calif. 4414, for NHA. C. I. Warnecke, 1700 Financial Center Bldg., Oakland, G. E. Bangs, 605 Market St., San Francisco, and V. G. Raney, 233 Post St., San Francisco, archts. CD 12/8—ENR 12/10.

★†**Conn., Bridgeport**—Bridgeport Housing Auth., 252 Hallett St., takes bids 8 days after receipt of priority, 60 bldgs. comprising 400 unit dwellings, Conn-6057, for NHA. Phelan & Beckwith, 211 State St., archts. CD 12/14—ENR 12/17 under BA.

†**Conn., Bridgeport**—St. Vincents Hospital, Main St., hospital bldg. and nurses home. **FWA.** J. G. Phelan, 1336 Fairfield Ave., archt. CD 9/17—ENR 9/24.

†**Conn., Hartford**—Mt. Sinai Hospital, 199 Capitol Ave., hospital, Conn.-6181. $275,000. **FWA.** Ebbets & Frid, 15 Lewis St., archts. CD 11/9—ENR 11/12.

†**D. C., Wash.**—Pub. Bldgs. Admin., North Interior Bldg., hospital bldgs., at Columbia Hospital, DC 49107. 175,000. **FWA.** CD 12/18—ENR 12/24.

★†**Tennessee**—Public Housing Auth., NHA, Georgia Savings Bank Bldg., Peachtree and Broad Sts., Atlanta, Ga., dormitory units 44082, and dwelling units 40038. Under $1,000,000. Hart, Freeland & Roberts, 3rd Natl. Bank Bldg., Nashville, Archts. CD 12/8—ENR 12/10.

†**Tex., San Antonio**—City, public health center, facilities, addn. and remodeling 8 story, brick, concrete bldg. $100,000. DPW allot. Spillman & Spillman, Hicks Bldg., archts. CD 12/10—ENR 12/17.

LOW BIDDERS

†**Alabama** — Pub. Housing Auth., NHA, Georgia Savings Bank Bldg., Peachtree and Broad Sts., Atlanta, Ga., Dec. 14, housing, Ala. 1142, from Joseph P. Snyder Co., 710 1st Natl. Bank Annex, Mobile, **$352,700.** CD 11/18—ENR 1/26.

†**Arizona**—U. S. Eng., 751 S. Figueroa St., Los Angeles, Calif., Dec. 16, bldgs., utilities, No. 934, Yuma Co., from Nordin Constr. Co., 3030 Exposition Blvd., Los Angeles, Calif., less then **$500,000.**

†**California**—Oakland City Housing Auth., 935 Union St., Oakland, Dec. 16, grading, excavating work for housing Proj. Calif. 4116, from C. Dudley De Veibiss, Hotel Oakland, Oakland, **$42,600;** for housing Proj. Calif. 4115, from Ariss-Knapp Co., 961 41 St., Oakland, **$94,340,** for NHA.

†**Colorado** — Pub. Housing Auth., NHA, Dierks Bldg., 10 St. and Grand Ave., Kansas City, Mo., Dec. 14, housing, from Mead & Mount Const. Co., Denver Natl. Bank Bldg., Denver. CD 12/1—ENR 12/3.

★†**Connecticut** — East Hartford Housing Auth., 740 Main St., East Hartford, Dec. 18, dormitory housing and family units, Conn. 6128, for NHA, from Wadhams, May & Carey Co., 15 Lewis St., Hartford, **$641,750.** CD 12/15—ENR 12/3.

†**Kansas**—Pub. Housing Auth., NHA, Dierks Bldg., 10 St. and Grand Ave., Kansas City, Mo., demountable houses, from Johnson, Peterson, Busboom & Rauh, Salina, **$225,500.**

★†**New York**—Niagara Falls Housing Auth., City Hall, Niagara Falls, Dec. 18, bldgs., NYS-18, for NHA, from Wilcox Constr. Co. and Bowen Fireproofing Co., 25-20 41st Ave., Long Island City, **$1,463,000.** CD 12/3—ENR 12/10.

†**South Carolina**—U. S. Eng., Camp Croft, Dec. 11, bldgs., Spartanburg Co., from W. M. Fine, Spartanburg.

★†**South Carolina**—Charleston City Housing Auth., Charleston, Dec. 21, from Skinner & Ruddock, 155 E. Bay St., Charleston, housing, for NHA, incl. Projects S.C. 38067 A and B, S.C. 38068 A, and S.C. 38069 A, **$500,302;** Project S.C. 38069 A, **$328,118;** Projects S.C. 38067 A and B, and S.C. 38068 A, **$172,184.** CD 11/2—ENR 11/5.

★†**Texas**—Pub. Housing Auth., NHA, 1309 Electric Bldg., Fort Worth, housing, Tex. 41224, from Kucharo-Union Constr. Co., 1901 Easton Blvd., Des Moines, Ia., **$1,053,180.** CD 12/14—ENR 11/12.

†**Texas**—U. S. Eng., 25 St. and Avenue F, Galveston, Dec. 12, bldgs., facilities, water lines, sewer, electrical distr. sys., etc., Harris Co., from Frank W. Sharp Const. Co., 2407 Stanmore Dr., Houston, **$50,000-$100,000.** CD 12/9—ENR 12/3.

★†**Washington**—Vancouver Housing Auth., Vancouver, Dec. 15, housing, Wash. 45139, for NHA, from Waale-Camplan Co., 730 S.W. 16 St., Portland, Ore., **$1,298,000.**

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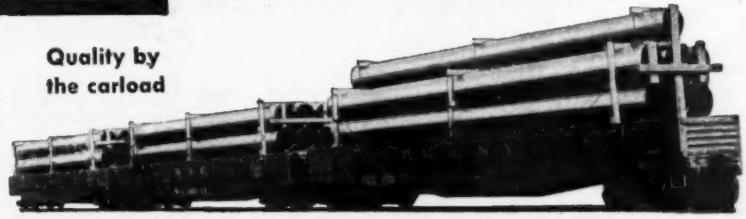

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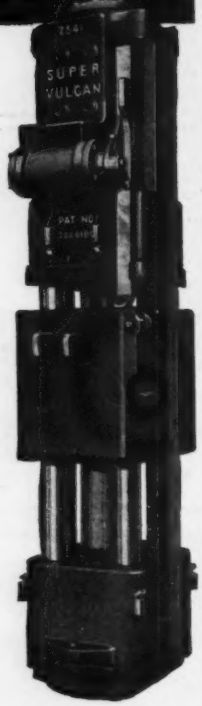

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PUBLIC BLDGS. (Low Bidders, Cont'd.)

†**Wash., Vancouver**—Clark General Hospital, c/o A. Bancroft, secy.-treas., 3400 Main St., Dec. 15, hospital addn., Docket 45-204, from King & Co., 2717 T St., **$206,000. FWA.** CD 12/9—ENR 10/8.

CONTRACTS AWARDED

California—Alameda Housing Auth., C. Anderson, exec. dir., 1711 2 St., Alameda, grading and fill, some sewer work in connection with housing. Encinal Project Calif. 4114, for NHA, to Leibert-Caletti Co., Albert Bldg., San Rafael. CD 12/10—ENR 12/17.

†**California**—Industrial Company, electrical sub-station, to MacDonald & Kahn, Inc., 200 Financial Center Bldg., San Francisco. Federally financed.

★†**California**—Oakland City Housing Auth., 935 Union St., Oakland, housing, Cal 4116, for NHA, to Monson Bros., 475 6 St., San Francisco. J. J. Donovan, 950 Parker St., Berkeley, archt.

†**California**—Oakland City Housing Auth., 935 Union St., Oakland, grading, excavating work in connection with housing, Proj. Cal. 4116, for NHA, to Piombo Bros. & Co., 1671 Turk St., San Francisco, **$89,592.** J. J. Donovan, 950 Parker St., Berkeley, archt.

†**California**—U. S. Eng., 1209 8 St., Sacramento, motor fuel storage and facilities, Yuba Co., to Independent Iron Wks., 821 Pine St., Oakland, under **$50,000.**

★†**Calif., San Diego**—Yards & Docks, Navy Dpt., 18 St. and Constitution Ave. N.W., Wash., D. C., west coast sound school, NOY 5880, to Stanton-Reed Co. and J. W. Breedlove Corp., 816 W. 5 St., Los Angeles, **$1,259,000.**

†**Colorado**—Pub. Housing Auth., NHA, Dierks Bldg., Kansas City, Mo., houses, to C. D. Poland, Grand Junction. Est. **$150,000.** CD 12/15—ENR 12/17.

†**Florida**—Pub. Housing Auth., NHA, Georgia Savings Bank Bldg., Atlanta, Ga., apartments, Fla. 8162, and family dwellings, Fla. 8163, to Newton & Glenn, Hattiesburg, Miss., **$274,119.** Awarded 12/15. CD 11/2—ENR 11/5.

†**Florida**—U. S. Eng., Court House, Jacksonville, bldgs., Inv. Neg. M.B. 43-12, to L. F. Prue Corp., 1440 Alton Rd., Miami Beach, est. under **$500,000*****sewage collection, water distr. sys., Inv. Neg. M.I. 43-12, and clearing, grubbing, grading, paving, Inv. Neg. Jax 43-206, to W. T. Price Dredging Corp., 3220 S.W. 27 St., Miami, under **$100,000,** all foregoing Dade Co.

†**Florida**—U. S. Eng., U. S. Courthouse & Post Office, Jacksonville, addnl. bldgs., Inv. NEG-JAX-43-427, Dade Co., to P. McCarl, 4201 Indian Creek Dr., Miami, less than **$500,000.**

★†**Florida**—U. S. Eng., U. S. Courthouse & Post Office, Jacksonville, bldg., Inv. NEG-JAX-43-406, to Fred Howland, Inc., Postal Bldg., Miami, less than **$1,000,000***** clearing, grubbing, grading, draining, Inv. NEG-JAX-43-438, to Hubbard Constr. Co., Orlando, less than **$1,000,000*****railroad spur track, Inv. NEG-JAX-43-436, and railroad spur track, Inv. NEG-JAX-43-440, to B. B. McCormick & Sons, Inc., Graham Bldg., and Okeechobee Constr. Co., 140¼ Stockton St., Jacksonville, each less than **$100,000** ea. project***paving, imprvs., Inv. NEG-JAX-43-438, to H. E. Wolfe, St. Augustine, less than **$1,000,000,** all foregoing in Orange Co.

†**Idaho**—U. S. Eng., Pittock Blk., Portland, Ore., bldgs., facilities, Power Co., to J. W. Brennan, Pocatello, **$100,000-$500,000,** awarded 12/18.

†**Kentucky**—U. S. Eng., U. S. Post Office & Courthouse, Cincinnati, O., laundry and storage bldg., Boyle Co., to Leo J. Brielmaier, Inc., 3401 Harrison St., Cincinnati, O., **$50,000-$100,000.**

†**Louisiana**—U. S. Eng., 25 St. and Avenue F, Galveston, Tex., bldg., East Baton Rouge Parish, to Perrilliat-Rickey Constr. Co., Inc., 1530 S. Rendon St., New Orleans, and Barber Bros. Contg. Co., Reymond Bldg., Baton Rouge, awarded 12/14; bldg. and covered walks, Inv. 1096-43-186, East Baton Rouge Parish, to R. P. Farnsworth & Co., 1515 S. Salcedo St., New Orleans. Awarded 12/15.

†**Louisiana**—U. S. Eng., 25 St. and Avenue F, Galveston, Tex., bldgs., Inv. 43-201, Caicasieu Parish, to R. P. Farnsworth & Co., 1515 S. Salcedo St., New Orleans. Awarded 12/14.

†**Louisiana**—U. S. Eng., 25 St. and Avenue F, Galveston, Tex., post office, Vernon Parish, to J. A. Harper, Crowville. Awarded 12/15.

†**Maine**—U. S. Eng., Park Square Bldg., Boston, Mass., concrete bldgs., to Caye Constr. Co., 356 Fulton St., Brooklyn, N. Y. Est. **$150,000-$500,000.** Bids 12/14. CD 12/10.

†**Maine**—U. S. Eng., Park Square Bldg., Boston, Mass., temporary housing, No. 175-43-NEG 158, Aroostook Co., to J. R. Clanchette, 120 Main St., Pittsfield. Est. **$100,000-$500,000.** Bids 12/14. CD 12/11.

†**Maryland**—U. S. Eng., Hearst Tower Bldg., Baltimore military housing, Baltimore Co., to Aetna Constr. Co., 5318 Beaufort Ave., Baltimore.

†**Massachusetts**—U. S. Eng., 31 St. James Ave., Boston, repair shop, Barnstable Co., to Franklini Constr. Co., Medford, under **$50,000.**

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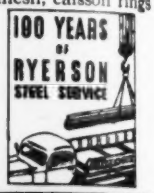

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PUBLIC BUILDINGS (Contracts Awarded, Cont'd.)

†**Montana** — Pub. Housing Auth., NHA, Skinner Bldg., Seattle, Wash., housing, Mont. 24011, to Cahill-Mooney Constr. Co., 342 S. Main St., Butte. Est. **$300,000.** A. V. McIver, Strain Bldg., Great Falls, archt.

†**North Carolina**—U. S. Eng., 308 Customhouse, Wilmington, Del., temporary frame bldgs., utilities, sprinkler sys. covered walks, Cumberland Co., to R. F. Kirkpatrick, Burlington, **$100,000-$500,000.**

†**North Carolina**—Defense Plant Corp., 811 Vermont Ave. N.W., Wash., D. C., 4 superintendent's houses, 4 pump houses, Guilford Co., to G. W. Kane, Greensboro. Bids 12/7. Plantation Pipe Line Co., Atlanta, Ga., lessee.

†**Ohio**—Industrial Company, 2 story, 168x288 ft. personnel and cafeteria bldg., to Cleveland Const. Co., 3868 Carnegie Ave., Cleveland. Est. **$400,000.** Defense Plant Corp. will finance. CD 12/11—ENR 12/17.

★†**Ohio** — Industrial Company, plant, to Rust Eng. Co., Clark Bldg., Pittsburgh, Pa., over **$2,500,000.** Defense Plant Corp. will finance.

★†**Pa., Phila.**—Yards & Docks, Navy Dpt., 18 St. and Constitution Ave. N.W., Wash., D. C., heating, plumbing, air piping, sewers, and water sys., factory, Navy Yard, NOY 5706, to John Borden & Bro., 637 N. 19 St., **$219,679.**

†**South Carolina**—U. S. Eng., North Charleston, temporary frame bldg., Charleston Co., to Worthy & Johnson, Peoples Bldg., Charleston.

†**South Carolina**—U. S. Eng., Camp Croft, addnl bldgs., Spartanburg Co., to Fiske-Carter Constr. Co., Spartanburg.

†**South Carolina**—U. S. Eng., 33 Customhouse, Charleston, addnl. bldgs., Greenville Co., to Daniel Constr. Co., Greenville.

†**Texas**—U. S. Eng., Fort Sam Houston, bldg., utilities, outside electric distr. sys., etc., Bexar Co., to J. H. Raybourn, 326 Funston St., San Antonio, **$50,000-$100,000.**

★†**Virginia**—Yards & Docks, Navy Dpt., 18 St. and Constitution Ave. N.W., Wash., D. C., battalion training camp, at Magruder, NOY 5730, to Doyle & Russell, Central National Bank Bldg., Richmond, **$10,200,000.**

†**Washington**—U. S. Eng., 800 3 Ave., Seattle, steam plant bldg., Spokane Co., to Clynde M. Ludberg Co., W 326 1st St., Spokane, **$100,000-$500,000.**

★†**South America, Peru**—Vanadium Corp., 420 Lexington Ave., New York, N. Y., plant, to Rust Eng. Co., Clark Bldg., Pittsburgh, Pa. Est. **$4,000,000.** Defense Plant Corp., Wash., D. C., will finance.

COMMERCIAL BUILDINGS

PROPOSED WORK

Me., Bath—Hyde Windlass Co., 2 Federal St., completing plans by A. J. Harriman, 53 Front St., 2 story, 110x100 ft. brick, frame office unit, Washington St. $150,000.

N. J., Long Branch—Shore Estates, Inc., 611 Ocean Ave., plans by McMurray & Schmidlin, 968 Stuyvesant Ave., Union, three 2 story, bsmnt., brick veneer garden type apartments. $150,000.

N. J., Summit—Overlook Hospital, 193 Morris Ave., soon lets contract, 1 story, brick hospital addn. Leslie Dennis, 333 N. Broad St., Elizabeth, archt.

O., Columbus—Capitol Investment Co., 22 W. Gay St., four 12 family apartments, Oak St. $150,000.

Pa., Mt. Pleasant—David Simon, 111 N. Diamond St., 2 and 3 story, bsmnt., 80x175 ft., brick, steel store and apartment bldg., 529-31 Main St. $150,000.

Pa., Phila.—A. P. Orleans, 100 W. Rockland St., twenty-two 2 story, brick, stone houses, Medvale Ave., west of Wissahickon Ave.

CONTRACTS AWARDED

Calif., San Bernardino—G. G. Larfield, 2725 Woodhaven Dr., Los Angeles, 53 frame, stucco dwellings, Scenic Knolls Dist. Owner builds. Over **$150,000.**

Calif., San Rafael—K. H. Smithon, c/o contractor, 1 story residences, to M. J. King, 221 Franklin St., San Francisco. Est. over **$150,000.**

Kan., Olathe—W. H. Shackelford, 7510 Ward Pkway., Kansas City, Mo., 50 houses. Owner builds. Approx. **$150,000.** Neville & Sharp, Midland Bldg., Kansas City, Mo., archts.

La., Algiers—Albernia Realty Co., Union Bldg., New Orleans, housing, Shirley Dr., to E. L. Brehm, 321 Dodge Ave., New Orleans. Est. **$200,000.** Awarded 12/16.

★**Md., Middle River**—Arvil Corp., 1028 Connecticut Ave. N.W., Wash., D. C., 339 housing units, to Muhleman & Kayhoe, Inc., 1413 H St. N.W., Wash., D. C. Alan B. Mills, 1822 I St. N.W., Wash., D. C., archt.

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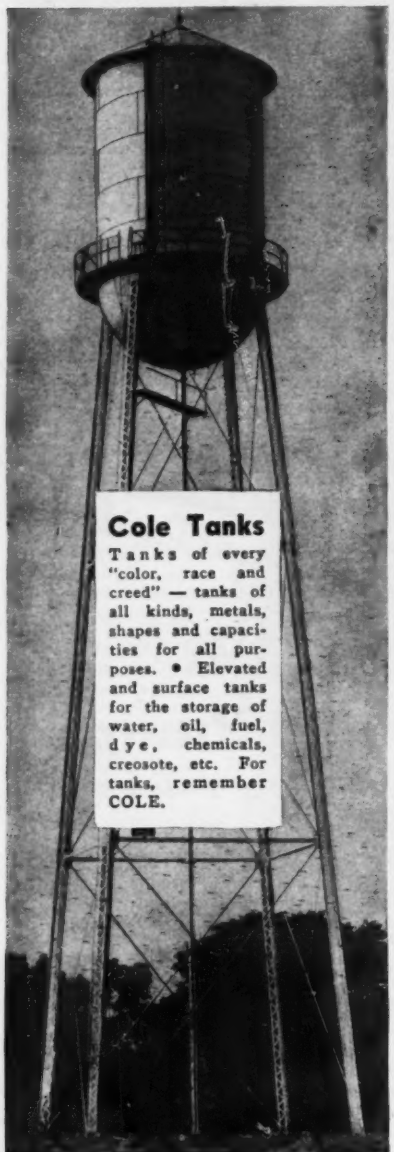

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COMMERCIAL BLDGS. (Contracts Awarded, Cont'd.)

Chas. W. Menard, 927 15 St. N.W., Wash., D. C., engr.

Mich., Lansing—Edward W. Sparrow Hospital, 1215 E. Michigan St., general contract hospital addn., to Sorenson-Gross Constr. Co., 2505 Lapeer St., Flint, **$286,375.** Bowd-Munson Co., 499 Wilson Bldg., archts.

N. J., Long Branch—American Victory Homes, Cedar Ave., twenty-six 2 story, bsmnt., frame, brick veneer residences, separate contracts, **$155,000.** Electrical contract, to E. Hickman, 293 Union St. Lodi. Guernsey Wheeler, 162 Mountain Way, Rutherford, archt.

Pennsylvania—Eagle Certified Homes, c/o A. Palermo, builder, 5350 Forbes St., Pittsburgh, twenty-four 2 story, bsmnt., 26x57 ft. brick, tile apartment bldgs., Stowe Twp., separate contracts. **$288,000.**

Tex., San Antonio—Home & Rent Properties, Inc., 2110 S. Flores St., 1 story frame dwellings, force account. Approx. **$150,000.**

INDUSTRIAL BUILDINGS

PROPOSED WORK

Ill., Blue Island—FACTORY—Wickwire-Spencer Steel Co., 221 N. La Salle St., Chicago, remodeling factory. $50,000.

★**Ill., Lincolnwood (P. O. Morton Grove)**—FOUNDRY — Bell & Howell Co., 1801 Larchmont Ave., Chicago, plans by Mundie, Jensen, Bourke & Havens, 39 S. LaSalle St., Chicago, glass foundry. $500,000.

Minn., St. Paul—LABORATORY, etc.—Twin City Testing & Engineering Laboratory, C. W. Britzius, pres., 2482 University Ave., plans by Toltz, King & Day, 1509 Pioneer Bldg., 1 story, 40x120 ft., brick, tile laboratory and office bldg., Franklin and Cromwell Aves. $40,000.

★**Minn., South St. Paul**—REFINERY—Farmers Union Central Exchange, E. A. Syfestad, mgr., 1200 N. Concord St., oil refinery. $1,000,000.

Pa., Bristol—PLANT—Rohim & Haas Co., Bristol Pike, plant, Bristol Pike.

Tex., Bay City—OIL REFINERY—Humble Oil & Refining Co., Baytown, dismantling, removing oil refinery from near Palestine, reconstructing same at Bay City. Over $40,000.

Tex., Fort Worth—PLANT—Southern Ice Co., 2400 Cedar St., remodeling, expanding ice plant.

Wis., Milwaukee—FACTORY—Pelton Steel Castings Co., 148 W. Dewey Pl., plans by Building Eng. Services, 1101 N. Van Buren St., 1 story, 110x345 ft., brick, steel, and 1 story, 32x100 ft. and 18x22 ft. concrete factory bldgs., concrete fdns. $71,000.

CONTRACTS AWARDED

Calif., Los Angeles—FACTORY—Angeles Furniture Mfg. Co., 3650 E. Olympic Blvd., 60x177 ft. (2nd story) and 33x47 ft. frame, stucco factory addns. Owner builds. **$40,000.** J. E. Mackel, 1126 N. La Brea Ave., engr.

Md., Baltimore — YARD BUILDINGS — Pennsylvania R.R., L. P. Struble, ch. engr. (eastern region), Broad St. Sta., Phila., Pa., yard bldgs., North Point Rd., to James McGraw Co., North Point Rd., over **$40,000.**

Md., Curtis Bay (Station Baltimore)—GRAIN STORAGE BINS—U. S. Industrial Chemicals, Inc., Curtis Bay, 6 grain storage bins, to Fanning-Schuett Eng. Co., 4325 N. 3 St., Phila., Pa. Est. **$40,000.**

N. J., Finderne (mail Somerville)—PLANT—Diehl Mfg. Co., Finderne Ave., 3 story, bsmnt., 60x160 ft. and 60x90 ft. rein.-con. bldg., also 2 story, part bsmnt., 340 ft. square, rein.-con., masonry, steel bldg., to The Austin Co., 19 Rector St., New York, N. Y., **$366,000;** electrical work, to A. Neri, Inc., 614 Clinton St., Hoboken.

N. J., Port Reading—BUNK HOUSE—Reading Co., A. E. Owen, ch. engr., 12 and Market Sts., Phila., Pa., 2 story, bsmnt., concrete block, brick bunk house, to Calabro Constr. Co., 527 4 Ave., Elizabeth, **$55,000.**

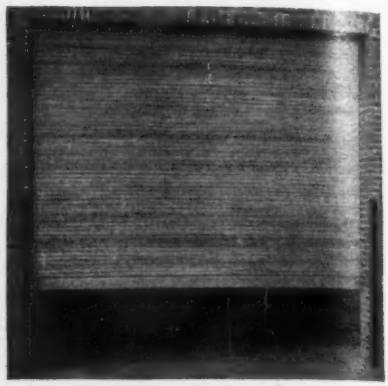
O., Elyria—FACTORY, etc.—Romec Pump Co., Elyria, 60x160 ft. factory, 24x57 ft. heat treating bldg., 24x57 ft. office, etc., to J. C. F. Shafer Co., Caxton Bldg., Cleveland. Est. **$100,000.** Silsbee & Smith, Turner Blk., archts.

Wis., Milwaukee—FACTORY, etc.—Milwaukee Machine Products Co., 1655 N. Water St., 1 story, part bsmnt., 80x120 ft. and 20x70 ft., brick, concrete factory and office bldg., concrete fdn., to F. J. Hinton, 1721 N. Water St.

Wis., West Allis (br. Milwaukee)—TRACTOR BUILDING—Allis-Chalmers Mfg. Co., 1126 S. 70 St., 1 story, 25x131 ft., brick alterations and addn. Tractor Bldg. 3, concrete fdn., to Meredith Bros. Inc., 121 E. Washington St., Milwaukee. C. E. Meyer, c/o owner, archs.

For Proposal Advertisements see p. 95

Steel Rolling Door Efficiency in KINNEAR WOOD ROLLING DOORS



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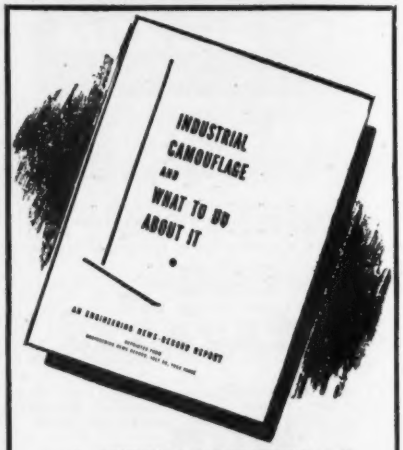

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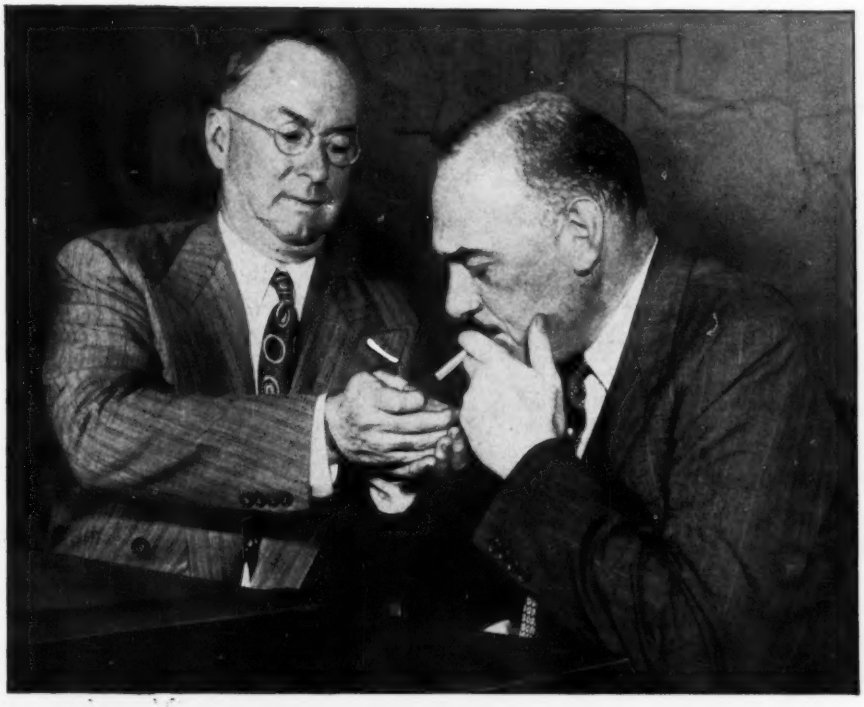
The Story That Must Be Told



Two men who know the story best: Donald Nelson, Chief of the U. S. War Production Board, and (right) Oliver Lyttelton, Great Britain's Minister of Production.

BETWEEN THE LINES of today's war news is written a story that is even more vital than the news itself. For through that story we begin to discern the pattern of victory, not yet complete in all its details but increasingly clear in its essentials.

It is the amazing story of how American industry has responded to the call for the weapons of total war, of how its technicians, workers, and managers are driving through an unprecedented task of fantastic size and complexity.

France fell in June 1940. During that month this country produced about $150,000,000 in war goods. By June 1941 the Nazis had overrun the Balkans; and in that month our war production was $800,000,000. The fateful month of December 1941 gave us an output of $1,800,000,000—an increase better than tenfold in eighteen months. And in May 1942 our total expenditures for war equipment and supplies mounted to the staggering total of $3,500,000,000.

This is an increase of twentyfold within two years, of itself a stupendous industrial achievement. But what is even more important, that achievement already is making itself felt the world over—in the Orient, in Australia, in Libya, in Europe, in the Coral Sea, at Midway Island, at the Aleutians, and wherever else we find a battlefront manned by free men.

To accomplish it, many industries have been pouring out war materials at a rate that only six months ago did not seem even remotely possible. Starting from scratch, our factories have turned from their peacetime jobs, first to meet and then to surpass the most hopeful estimates of what might be expected of them.

To do this they have drawn heavily upon all of their resources. Their skilled and unskilled

man-power has thrown into the task a war-born will to work; their research staffs have bent to it all of their scientific resources; their engineers have applied to it their utmost ingenuity; their executives have devoted to it the full measure of that managerial skill which has won for American industry the respect of the modern world.

For the first time in history we have pushed the accelerator of the world's greatest engine of mass production down to the floorboard. Always in times of peace, factory men have had to gear production to what the markets would take. But now the market they are called upon to serve is hungry for the last ounce of potential output. For war confronts industry with a demand limited only by its capacity to produce.

During these feverish months, while a desperate world has watched breathlessly to see how American industry would perform as the arsenal of democracy, we of McGraw-Hill have followed with mounting pride — at times almost with wonder — a new miracle of industrial achievement.

Some day the full story of this American industrial effort will fill a brilliant chapter in the epic history of our times. Meanwhile it would be premature to celebrate the completion of this task. For victory has not yet been won; that still lies at the far end of a road that we may find to be long and arduous.

But even now we can be certain of one essential of that victory. American industry is doing its job; it is delivering all that the people have asked of it — and more.

As I have watched with my associates the unfolding of this picture, I have wished that it were possible to broadcast it, in full color and wealth of detail, to the people of America, so that they could understand at least, in part, the job their industry is doing for them. It would help, it seemed to me, if the men of industry themselves, each so intent on his own task, knew what their fellow-workers in other fields have been doing.

However, the managers of industry have been far too busy **doing** to talk. They are going to be just as busy for some time to come. Naturally, many details are yet to be spread upon the record and, indeed, the full story cannot be told. But that part of the story that can be told is well worth the telling and the hearing, if only for its revelation of the spirit of an awakened America, throwing its all into the fight against the tyranny that has brought so many of the world's little people under its heel.

The 1941 war production of the United Nations, exclusive of the United States, equalled the total 1941 war output of Germany with all of its captive plants and enslaved labor. Since Germany's 1941 operations were at maximum capacity no further increase is possible. British output has been expanding to the point where its 1942 production is considerably ahead of Germany's.

In May 1942 American war production passed the British output 50 days ahead of schedule. In 1943 it will be 3 times that of the British.

This has been brought about under the leadership of Donald Nelson and the War Production Board, the Army, the Navy, the Maritime Commission, with the cooperation of management and labor. It has been furthered by the cooperation of Oliver Lyttelton, British Minister of Production, and other British production authorities.

But the story goes far beyond that. It gives us a glimpse of the America as it will emerge from this war, its industries again setting world standards of production, which will become the spearhead of our post-war economy.

This is a story that cannot be adequately told in generalities. It must be told in some detail. For instance, the great accomplishments of the machine tool industry, the great forward strides made by the aviation industry, the tremendous achievements of the chemical industry, the amazing conversion of many industries will warm the hearts of Americans.

These aspects of the subject deserve the fullest treatment and will be told month by month in these pages until the story has been completely unfolded. We will try to give a concise overall picture of the war job that industry has done and still is doing. You will find it a thoroughly American story of high American achievement in which every American can take pride and from which every American can take hope for the future of his country.

The story is far too significant to be withheld any longer.

James H. McGraw, Jr.

President, McGraw-Hill Publishing Company, Inc.

This message is appearing in all McGraw-Hill industrial and business publications, reaching over a million readers.

Machine Tool Builders . . .

the men behind our war production achievement

IT TOOK GERMANY six years to get ready for this war, and Japan even longer. But in less than twenty-four months American industry, starting from scratch, has caught up with and surpassed the war production of the Axis.

When France fell in June, 1940, we unfortunately had no gigantic munitions makers, like the Krupp or Skoda works, to turn to. We had been devoting our attention to making refrigerators and vacuum cleaners and motor cars and lawn mowers. Ordnance output for our Army was a mere million dollars a month. A sad commentary on our National state of mind and our lack of responsible political leadership.

Yet during June of this year, our industries, transformed from peacetime pursuits, produced close to a thousand times that amount. A thousand-fold increase in two years!

The same spectacular gains hold throughout our war program — for ships, planes, guns, tanks, a thousand items. We are well on our way toward the 60,000 planes, 20,000 anti-aircraft guns, 45,000 tanks and 8,000,000 tons of shipping that the President asked us to produce in 1942, and toward the much larger production projected for the year 1943.

We are well on our way thanks to a number of factors, one of the most vital being the extraordinary job done by the machine tool industry. For it has equipped America's metal-working shops with the tools they need to turn out the vast quantities of war weapons.

The machine tool industry's importance springs from the fact that almost every metal product, from mechanical pencils to giant guns, is made with machine tools. They transform pieces of steel into parts for automobiles, farm implements and radios — and for airplanes, guns and tanks.

The Garand rifle, highly praised by General MacArthur at Bataan, has 72 metal parts requiring 1040 separate cutting operations on machine tools. A 40-millimeter gun mount is made up of 1500 separate parts, built to the tolerance of a Swiss watch. Each part must be machined, not once, but several times.

No wonder that when the American defense program was undertaken two summers ago, the American machine tool industry was the first to be called into service. Ninety-five thousand machines were wanted as quickly as possible from 250 builders who in peacetime had produced some 25,000 machines a year.

But the demand did not stop there. The Army, the Navy and the Air Force kept asking for more as the war production program was expanded again and again. Nor was that all. The entire anti-Axis world besieged Washington with urgent requests — from London to Moscow, from Ottawa to Chungking.

To a man the machine tool builders responded. New factories and additions to old plants were built, with deliberate disregard of the prospect that all these sharply expanded facilities could not be used after the war.

To increase output from existing plants practically every company went to two long shifts or three short ones. The industry's work-week was greatly extended. From the beginning of our effort, it has been the longest of any industry.

Working forces were enlarged from 40,000 to 110,000, and this latter figure does not include tens of thousands of employees with sub-contracting firms. Though machine tool building requires a higher degree of individual skill than most products, "learner" courses have been set up to train men quickly. Over 15,000 men and women now are in training.

The machine tool builders were among the first to go in for sub-contracting. They have farmed out parts, subassemblies and complete

machines right and left. To meet their needs, for example, repair shops of carpet mills are making milling machines, a laundry machinery company is producing radial drills, and an automobile body builder is making planers and boring mills.

Machine tool manufacturers quickly shelved peacetime practices to concentrate manufacture on the sizes and types of machines critically needed for the war program. They adopted mass production methods wherever possible, although machine tools are essentially a tailor-made product. They sent their sales engineers, as did machine tool dealers also, to hundreds of munitions makers with invaluable advice as to tooling up most efficiently for their particular jobs.

The swift action taken by the machine tool builders shows what private enterprise can do to meet a national emergency. They were the first to institute a voluntary system of priorities.

All of this involved an almost explosive expansion of the industry. Machine tool builders produced an average of only 7,500 machines a year from 1931 to 1934. In an ordinary year, output totals 25,000 machines. But in 1940, it rose to 112,500, and in 1941 to 187,500.

The 95,000 machine tools wanted for the original defense program were built and delivered within eight months.

Today more than 1,000 machine tools are being shipped to war factories every twenty-four hours, and for seven days a week. Each month's output exceeds that of an entire normal peacetime year and is five times that of the depression year of 1932. And each succeeding month is shattering all previous records.

It is this amazing performance that led Under Secretary of War Robert P. Patterson to declare that "machine tools are the foundation on which our production structure is built. American machine tool men are doing a stupendous job. Machine tools are now being turned out at a rate of $1,380,000,000 a year. Machine tool designers have worked to improve tools so much that machine tool effectiveness today is one-third to one-half greater than it was in 1930. Our production today is 16 times what it was—in capacity to cut metal—at the peak of the World War."

The results of this performance by this key industry, so satisfying to the Nation, do not spring wholly from the numbers of machine tools produced. They stem also from their improved quality and greater productivity.

Today's warfare differs radically from that of 1917-1918. It calls for mechanized weapons so complicated in design and built to such a fine degree of accuracy that they are beyond comparison with the weapons of a generation ago.

Machine tools, completely redesigned during the depression years, are meeting these new and exacting requirements. In addition, thousands of machine tools of special design, without counterpart in peacetime work, have been built.

The record of the war industries most directly dependent on the machine tool industry speaks for itself. One tank manufacturer alone is producing more than thirty big tanks a day. A midwestern plant is completing 35 anti-aircraft guns a day, round the clock without interruption. A tank engine factory, tooled up to make 650 units a month, is actually building over 1500 a month. Demolition bombs, destined for Berlin and Tokyo, are being made by the tens of thousands every month. Machine guns are being produced at a rate of 50,000 a month.

These manufacturers, all machine tool users, are far in advance of the timetables set for them.

All this is good news for the American people and bad news for the Axis. It is proof that American industry, with each individual and specialized industry doing its part, is living up to the faith put in it by the American people.

But it is more than that, too. It is a guarantee of our confidence in the peacetime future of American industry and of the free enterprise system under which this miracle has been wrought.

Perhaps more than anything else, the foundation of that confidence must be faith in the farsightedness, the ingenuity, the engineering and designing skill, and the managerial know-how of the machine tool makers.

On them we depend for the most essential tools of the post-war production economy. Without them, our vision of better living standards and full employment through more efficient production and distribution can never be more than a vision.

What they have done as the toolmakers for war is proof of what they can do as the toolmakers of peace. How they have done it as free men is a demonstration of what free men will do.

James H. McGraw, Jr.

President, McGraw-Hill Publishing Company, Inc.

This message is appearing in all McGraw-Hill industrial and business publications, reaching over a million readers.

The Aviation Industry is doing its job...

A Year's Production A Week — Every Week

A MERE hundred planes a month in 1938; 200 in 1939; 450 in 1940; 1,600 in 1941, and today, as this is written, plane production goes on at a rate of 5,000 a month. A previous year's production now in one single week — every week.

So begins the story of the greatest industrial expansion in history; an industrial miracle that far surpasses anything our enemies ever have done or can do. Not only did we out-produce the Axis but the acceleration in our production during the past 12 months exceeded the greatest increase in German output during their forced-draft war preparation of 1939, when their production rose from 1,100 to 1,600 planes per month.

The toughest part of our job was accomplished in 20 months. We boosted deliveries from 100 or so to 1,000 planes a week, passing the combined Axis powers. Today, Germany's curve is flattening; ours is climbing steeply. Lt. Gen. Henry H. Arnold, Chief of the Army Air Forces, assures us that Army contractors will produce not less than 148,000 planes in the remainder of 1942 and in 1943. During that same period Navy contractors will turn out at least 37,000 additional planes.

Manpower in the airframe, engine and propeller industries was increased from 125,000 to 450,000 workers during the past 20 months, with the prospect that the industry will be employing more than 1,000,000 men and women in 1943. Many manufacturers are solving their personnel problems by recruiting women workers. More than 40,000 of them — teachers, stenographers, waitresses, housewives and school girls — today are welders, assemblers, machine operators and inspectors on aircraft production lines. Productive floor space in the airframe, engine and propeller industries expanded from 18,000,000 sq. ft. to nearly 55,000,000 sq. ft. during the last 20 months. Further expansion to more than 60,000,000 sq. ft. may be expected this year and an ultimate figure of more than 100,000,000 is a distinct possibility.

To grasp the full magnitude of this task we must remember that a single medium bomber has 30,000 parts, which are built into 650 minor sub-assemblies to make 32 major sub-assemblies. The entire process involves 30,000 man hours of labor. Each of the two engines in this plane requires 50,000 specialized inspections. Every one of the 50 instruments entails many hours of precision workmanship. Yet today there is one factory turning out 4 bombers every day. Another produces fighters at the rate of nearly 20 a day.

To the amazement of the entire world these manufacturing miracles were accomplished without sacrificing the high standard of American aeronautical equipment. There has been some loose talk about the quality of our combat airplanes as compared with those of our allies and our enemies. Indisputable evidence of the superior stamina of our aircraft under fire is written between the lines of almost every war communique. Every battle record tells a story of heavy losses inflicted at small cost upon numerically superior enemy forces. The consistency of this performance on all the far-flung battlefronts constitutes the most eloquent testimony of the high calibre of our designs, our manufacturing methods and the skill and daring of our pilots.

And let us remember that our decisive victory in the battle of production was not won without headaches and heartaches on the part of management, labor and government.

When the President sounded the call for 50,000 planes in the spring of 1940, the program called for only 5,500 military aircraft. Government and industry reeled from the shock — both determined, however, that it *could and would be done.*

The Army, the Navy and the old Defense Advisory Commission set to work to draft a program. This has been revised many times — upward! Congress then proceeded, more slowly, to modify the laws that would have obstructed the realization of the objective. Then the aviation industry, without contracts, in the face of discriminatory profit-limitative legislation, and with nothing but oral assurances of governmental intentions, went ahead with its Herculean expansion plans. New factories were completed long before facilities-contracts and their funds were forthcoming.

The rugged individualists who had founded and built the aviation industry cast aside their rivalries and embarked upon a period of unselfish cooperation. Priceless engineering experience was exchanged. Material was relinquished for transfer to plants where it was needed more urgently. Successful personnel training methods and experience in the use of women workers were pooled for the benefit of all concerned. During one re-

cent month, the cooperation among eight southern California plants averted more than 1,860 potential bottlenecks in production.

As the lessons of the war dictated the need for greater numbers of particular airplane types, many manufacturers accepted orders for planes designed and developed at rival factories. Striking examples are the long range bombers being turned out by plants where only trainers, fighters or dive bombers formerly were made.

Mindful of the risk involved in educating rivals, thereby creating future potential competition, subcontractors nevertheless were sought and trained by pioneer manufacturers. Makers of toys and wheelbarrows, automatic stokers and linoleum were among those who rallied to the call. Within a year subcontracting rose from 13 to 36 per cent of the total program. It still is rising.

When the automotive industry came into the picture, aviation manufacturers gave generously of their time and knowledge to start the newcomers. Liberal licensing arrangements enabled them to reap the full benefits of technical developments. Automotive engineers swarmed through the aviation plants in search of the exacting "know-how" of the aeronautical industry.

Each type of aircraft that reaches the production stage is the result of long periods of research, design and development. The unseen workers toiling in the wind tunnels and the laboratories of government and industry are the unsung heroes who tirelessly are striving to surpass all previous efforts. Their brilliant accomplishments are eloquent testimony of the superiority of men and women who are blessed with freedom of action and thought. Today more than 20 experimental combat airplanes are under development and will replace older types as soon as they fulfill the exacting requirements of our armed forces. Among these are aircraft that promise to outfight and to out-perform any and all of the much vaunted warplanes of the Axis military machine. And this without loss of production.

Every man, woman and child of all the United Nations may fervently be thankful that those who chart our course in aircraft production have not frozen design to such a degree as to make impossible the immediate adoption of improvements as they come out of these laboratories.

What does this brilliant record mean in terms of final victory?

Every newspaper reader has learned this basic war lesson . . . air supremacy is the essential ingredient of military success. As the balance of air power shifts, so do the fortunes of war.

In those dark days when our output was 500 planes a month, Germany's was 2,000 and the German air force was twice that of our Allies. When we reached 2,000 a month last fall, Germany had advanced to a monthly rate of 2,500. Today, as this is written, we have caught up with the enemy's backlog. The air forces of both sides are about equal numerically and United Nations' production exceeds that of the Axis by 27 per cent. Next summer (1943) both the air force and the output of the United Nations will be double those of all the Axis powers.

That is the pattern of ultimate victory!

The pattern of the peace to follow also is gaining in definition. The airplane has shriveled the world to one-fifth its former size. Its use as an instrument of destruction is but a momentary distortion of the pattern of human progress. Its potential power, as a stern preserver of peace, is beyond imagination. Today's air routes of our Army Air Force Ferrying Command are the international trade routes of tomorrow. Giant airliners, by reducing time and space, will speed fraternity among the nations and disunity will give way to better understanding and goodwill.

Flying freight trains, with aerial locomotives towing glider boxcars, will serve large cities, decentralizing population and giving to inland cities many of the commercial advantages of seaports. Air mail and passenger pick-up lines will fill the gaps between these transcontinental trunk lines and tie in the smallest hamlets. Universal fly-it-yourself services will provide airplane facilities for those who do not own low cost private aircraft. Roadable rotary wing aircraft and family planes of the fixed wing type may even run household errands.

The coming generation of business men who today is piloting our war planes will find aircraft as essential to business as it now finds them essential to victory.

Commenting on our war production record, Donald Nelson has said, "We are today in the position of men who realize that they are actually doing the impossible".

The mass production miracle that the aviation industry – management and workers alike – has performed through the all-out effort of free enterprise can and will serve civilization in peace as it has in war.

With this boundless new medium of transportation and its concurrent technological developments we shall rebuild our way of life to a rich, new fullness upon the ruins of a war-torn world.

James H. McGraw, Jr.

President, McGraw-Hill Publishing Company, Inc.

This is the third of a series of editorials appearing monthly in all McGraw-Hill publications reaching more than one and one-half million readers.

Construction—Builder of Bases

America's Great Peacetime Industry Goes to War

PUNCHED through 1,600 miles of trackless wilderness and rivaling the Panama Canal in strategic importance, the Alaska Highway will cut days and dangers from present supply routes . . . to Alaska . . . to the Aleutians . . . yes, to Japan itself!

This job, to be finished soon and well ahead of schedule, is but one example in thousands illustrating how construction sets the stage for our war effort . . . and why the construction engineer is vital to victory.

Back of America's busy production lines, expanding shipyards, growing cantonments and far-flung military bases is a series of swiftly executed construction jobs. Important jobs! *For the construction industry is a builder of bases. Bases for production—for training—for defense—and for attack.*

To conceive and to carry through so tremendous a program in a race against time is typically American. It requires enterprise and the sort of versatility that has been acquired by undertaking every kind of job; from a Boulder dam to a drydock, from a Pennsylvania Turnpike to a housing project, from a Radio City to a railroad tunnel . . . and taking it in stride. War's demands in the eyes of America's construction men, are simply more of the same—for a grimmer purpose, and under heavier pressure.

The civil engineers who develop the necessary designs, the contractors who execute them and the manufacturers who provide the equipment and materials, are as much a part of this war as are the men who face the enemy. The results of their labors are recorded in mounting production figures, and will be indelibly written in the military annals of this war. Those 60,000 airplanes, 45,000 tanks and 8,000,000 tons of shipping that the President asked for in 1942 will be supplied because—and only because—the construction industry did a Herculean plant-building job first—and fast.

This is the fifth of a series of editorials appearing monthly in all McGraw-Hill publications, reaching more than one and one-half million readers, and in daily newspapers in New York, Chicago and Washington, D. C. They are dedicated to the purpose of telling the part that each industry is playing in the war effort and of informing the public on the magnificent war-production accomplishments of America's industries.

Yes, construction, America's great peacetime industry, has gone all out for war. From a normal 6½ billion dollars in 1938, it got into its war stride last year with a 11½ billion dollar volume. And under the impetus of Pearl Harbor, the 1942 figure now promises to reach the unprecedented total of 15 billion dollars. "If buildings would win the war, Hitler would be licked now", said Lieut. Gen. William S. Knudsen recently. Which emphasizes the further fact that the construction industry was the *first* to go to war.

The technical and managerial talent that is accomplishing this mammoth job has had to find its strength and resources within itself. No possibility of "conversion" here! Only years of varied construction experience enabled it to tackle and to achieve the manifold tasks that building for war demands.

Take that cornfield, for instance, that Henry Ford picked for his record-breaking bomber plant. The spring mud was soft and deep when contractors moved in last year. They were entering a race against an almost impossible time limit. Before they could even begin on the plant itself, they had to build roads, lay a 4-mile water supply line and install a complete sewerage system with its disposal plant. But such varied jobs—each big in its own right—merely were antecedent to running up the framework and enclosure for the 60-acre factory itself. Or to using road-building methods to pave a floor that was the equivalent of 25 miles of 20-foot wide concrete highway.

It was a race against the approaching winter, and to win it they had to push their $1,000,000 worth of construction equipment to the limit—day and night. But win they did! It is accomplishments like these that explain how the nation's aviation factory floor space jumped from 18,000,000 to 60,000,000 square feet in

the past two years . . . why Fortresses and fighter ships are beginning to turn the scales of war in our favor.

"Somewhere in the Southwest" the Army called for a training base. The contractor who answered that call summed up his performance in characteristic fashion: "Beginning without so much as a contour map we had a $10,000,000 project ready for operation within 90 calendar days, and saved 3½ million dollars of the estimated cost".

At another Army camp a contractor assembled a crew of 20,000 men who put together 1,400 buildings in 125 working days, along with a sewer system, a water-supply and a street layout of which many a fair-sized city might be proud. This job swallowed up 2,000 carloads of lumber, and 26,000 kegs of nails. So perfect was the teamwork, from the general manager down through the hundreds of superintendents and foremen to the specialized crews, that as many as seventy buildings were erected in one single day.

But versatility and experience are not the only qualities that the construction engineer has in his tool chest. He has ingenuity, and he needed it when steel, copper, zinc and aluminum had to be used for combat equipment, and were denied him. Great hangars, conventionally of structural steel, were turned out with record-breaking timber arch spans. Reinforced concrete factories were designed to require only 3 lb. of steel bars per square foot instead of the customary 5 lb. Asphalt-impregnated paper was substituted for copper in flashings, cement-asbestos for galvanized steel in duct work. In the face of a materials shortage, he continued to build bases—safely, economically, and on time.

Construction ingenuity, too, is back of the records in Liberty ships, in war housing and a host of other facilities. Indeed, it was the construction industry that stepped forward to assume the bulk of the emergency shipbuilding program, leaving established yards free to handle more specialized Navy work. Naturally, it was easy for civil engineers and contractors to build the shipyards, but building ships was another story. It is a far cry from steel ships to conventional engineering structures, yet, drawing upon their bridge and building experience, the men of construction have turned out ships faster than they were ever built before.

How was this possible? . . . because the construction man sees every job as a new problem, views every precedent as something to be discarded in favor of something better. So instead of assembling the myriad separate pieces of each ship on the ways, he fabricated them into huge built-up sections. These he swung to the ways and welded them into place in a fraction of the time required by old methods.

Again, the demands for wartime housing for workers in industrial areas, at Navy bases, and near Army concentrations, have altered the meaning of "residential construction". The building of individual houses has given way to a form of multiple-unit project that calls for the skilled services of the architect, the civil engineer and the large contracting organization. On one such project, for example, a contractor experienced in large building and bridge construction employed an extensive system of prefabrication and site assembly that made possible the completion of 5,000 houses for war workers within five months.

All these activities, within the United States, parallel the achievements of other industries that serve the men at the front. But construction knows no continental limits. Its men are serving throughout the network of defense bases built in the West Indies, Greenland, and Iceland, and in the offensive bases that are taking form in the jungles and deserts of Africa, the harbors of the Persian Gulf, and the plains and mountains of Australia and Alaska. Already in this war, as in the last one, construction crews, like those at Wake and Guam, have dropped their peacetime tools to fight shoulder to shoulder with their comrades in uniform. Construction follows the flag to the farthest outposts in this global struggle.

* * * *

But while the construction industry thus serves the special needs of the armed forces, it must look after its job at home. It must keep the highways serviceable, the water supply safe, sanitary facilities adequate. There are home chores that cannot be neglected even in war.

And when we finish our No. 1 task of winning the war, the construction industry will again be called upon to help re-establish peacetime employment and to stimulate the normal industrial activities of the nation. It will raze, redesign and rebuild; it will bring modern sanitation to urban dwellers; it will safeguard fertile areas and cities from disastrous floods; it will improve all forms of transportation; it will design and build the facilities that will be needed to reconvert from war to peace. Its vision, versatility, experience and ingenuity will be as indispensable then as they are vital now.

Today it is building the bases that are needed back of every battle-line. Tomorrow it will build for a new and better era. Today it is laying the foundation for the victories that must be ours. Tomorrow it will lay the foundation for the peace that will follow these victories. In war and in peace the construction industry is the builder, the harnesser of nature's forces.

President, McGraw-Hill Publishing Company, Inc.

Electronics—Secret Weapon of War

Presager of a New Scientific and Industrial Era

THE END of World War I left scientists with a new plaything. They did not know it at the time but they had their hands on a revolution. Within two years the world had radio broadcasting. Within ten years the whole art of motion pictures had been transformed as talking pictures replaced silent movies. Within twenty years television was born and people were seeing pictures in motion by radio.

The fulcrum of this revolution is the electron tube, a new tool of illimitable possibilities. One form of the electron tube is the familiar radio tube; the much publicized electric eye is another. There are many other forms, each having distinct capacities for saving time, saving energy, saving money, protecting life, limb and property.

The electron tube puts the electron to work—and the electron is the basic building-block of the universe.

Electronics is the new art, the new science of putting the electron to work. Radio and sound pictures and television are aspects of electronics; but there are many other facets of this revolution which have been brewing since the last war.

The electron tube has a typical American family tree. Edison made the basic discovery of the "Edison effect" some sixty years ago. This was followed by the invention of the "Fleming valve" and the "de Forest grid". Then Armstrong contributed his share, and hundreds of engineers in garret and cellar workshops and in the great university and industrial laboratories went to work on the tubes which employ electrons. The tube was a plaything before the last war but the world conflict brought it out of the toy stage and made it a practical, powerful tool.

Today the electron tube is guiding the destinies of the greatest armies and fleets ever engaged in the history of the world.

It is a part of the nerve center of the battleship, directing its course, finding its adversaries, broadcasting running accounts of air battles to its crews, directing gun fire and determining ocean depth.

In the air it is the means of locating and identifying enemy planes, piloting planes automatically, giving communication from plane to plane and to shore. It is even operating the controls of the plane.

In the maneuvering tank, in the officer's car, on the back of a foot soldier it transmits and receives vocal messages from every unit of the fighting forces.

Along our borders, and those of our Allies is an electronic screen which counts, follows and identifies enemy planes a hundred miles away through darkness and through fog.

In industrial plants there are electronic counters that enumerate passing articles faster than the eye can see; automatic sorters which discard defective, oversize, undersize, off-color articles; automatic cutters; devices which inspect the inside of things which the eye cannot see; controls which protect workers; controls of temperature; smoke eliminators; intruder alarms; automatic controls for whole batteries of machines.

In its October progress report on American industry, the War Production Board points out that the radio business is five times greater than a year ago. From 20 million dollars a month last fall, it has increased to well over 100 million dollars a month. Unfilled war orders are in excess of 4 billion dollars.

From such vast growth will emerge a new engineering of products which will immeasurably improve our peace-time living.

After the war broadcasting will be infinitely more satisfactory: radio receivers will perform with a new fidelity which will amaze us. Television reception will be as flawless as the motion picture. Present secret war developments will readily be convertible to peace-time devices that will improve our standard of living.

No longer will ships collide with other ships, with icebergs or the shore. No longer will trains collide and aircraft crash in flight.

Garage doors will open as we approach and automatically close themselves. Electric lights will automatically go on and off according to our wants and needs. Furnaces and boilers will be controlled and smokestacks will cease to belch wasteful smoke. Air will be made dust free and germ free. Food contamination will be checked, meat made tender.

Grade crossings will be made safe and auto traffic will be automatically controlled.

Medical science sees new wonders ahead. Already it is possible to see "whiskers" on germs, germs which heretofore had been but a blur when viewed through the strongest optical equipment available.

Today so much secret development is going on in the ultra-high-frequency field that little can be said of its great future. But, without divulging military secrets, it can be said that ply-wood is being dried electronically in minutes instead of hours. Ultra-high-frequency welding (not to be confused with flame welding controlled electronically) is being done dramatically and efficiently.

Ultra-high-frequency heating promises to revolutionize the baking industry—it may even heat our homes.

What is this miracle working tube that can see, hear, taste, feel and smell a thousand times more sensitively than was possible heretofore?

What is the electron? No one knows, not even the scientists who know how to employ it. Electrons cannot be seen or felt; but if 6¼ million million million electrons are pushed through a 100-watt electric lamp per second, it will light up to full brilliance. For electric current merely is a mass movement of electrons. Each electron carries its share of electricity, and since the electron has so little weight it can be moved easily and quickly. Therefore, electricity transported by electrons can be turned on or off with great ease and speed. The electron tube merely is a device that controls the flow of electricity. It is an amplifier of power which can be made to do wondrous things. The sound of a termite gnawing inside of a log can be amplified a million times . . . to a roar that can be heard over great distances.

Colors can be classified and matched to a degree not possible by any other means.

Chemical or vitamin consistency can be recognized by counting radio activity within the subject being analyzed.

There is no industry in which electronic circuits cannot be used to speed up production, to increase accuracy, to do heretofore impossible tasks of calibration and measuring.

The opportunities afforded the engineers who are developing this new "electronic age" are limitless.

* * * *

Today the electronic industry is 100% at war. It is meeting the exacting demands made upon it.

Never before was electronic equipment called upon to withstand temperatures ranging from 75 degrees below to 150 degrees above zero Fahrenheit. Never before did radios and transmitters have to withstand the shaking and abuse to which they are being subjected today.

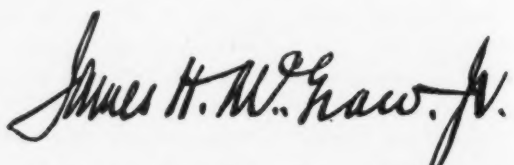
War demands have called for much redesign, much change of materials and a new conception of operating to tolerances never dreamed of in peace-time material. As a result, electronic parts and equipment makers are building better devices.

Universities and colleges are working at top speed to produce electronic engineers, for every radio operator in a plane, every radio man in the ground forces and on ships, every man operating radar equipment or electronic control devices in ordnance . . . and there are many thousands of them . . . must be a trained technician.

The wall of military censorship is high but it is no secret that one of Britain's best weapons that keeps the Luftwaffe from exterminating London is a radio locator, a device that gives alarm of approaching planes long before they can be seen with telescopes. Scanning the horizon constantly the locator warns of the enemy's approach. In the nose of a night fighter, the locator informs pilot and gunner when the enemy is within range. Neither is it a military secret that gunfire can be controlled by electronics, and that electronics is having a big share in training our new armies.

Necessity draws a veil over the most dramatic uses of electronics in warfare, but among those who know there is nothing secret about the fact that many of today's wartime applications will revolutionize our peace-time lives. Electronics will invade every industry with totally new devices and machines. The future of the electronics industry is limited only by man's imagination.

Such is electronics, and its destiny!



President, McGraw-Hill Publishing Company, Inc.

This is the sixth of a series of editorials appearing monthly in all McGraw-Hill publications, reaching more than one and one-half million readers, and in daily newspapers in New York, Chicago and Washington, D. C. They are dedicated to the purpose of telling the part that each industry is playing in the war effort and of informing the public on the magnificent war-production accomplishments of America's industries.

CONSTRUCTION TRENDS

Notes on significant movements in the construction industry

War shifts distribution of construction

ENGINEERING CONSTRUCTION rolled up the impressive wartime total of $9.3 billion in 1942, shattering the previous record established in 1941 by 57 percent, and eclipsing the high peace time marks of 1929 and 1940 by 137 and 134 percent.

Ranking almost equally in importance with the unparalleled volume gains over previous years were the shifts that occurred within the 1942 volume. Over 88 percent of the total was for federal construction compared with 61.5 percent in the defense year of 1941. Federal volume amounted to 11.8 percent of the pre-defense 1939 construction, and was only 2.6 percent of the 1929 pre-depression peak figure.

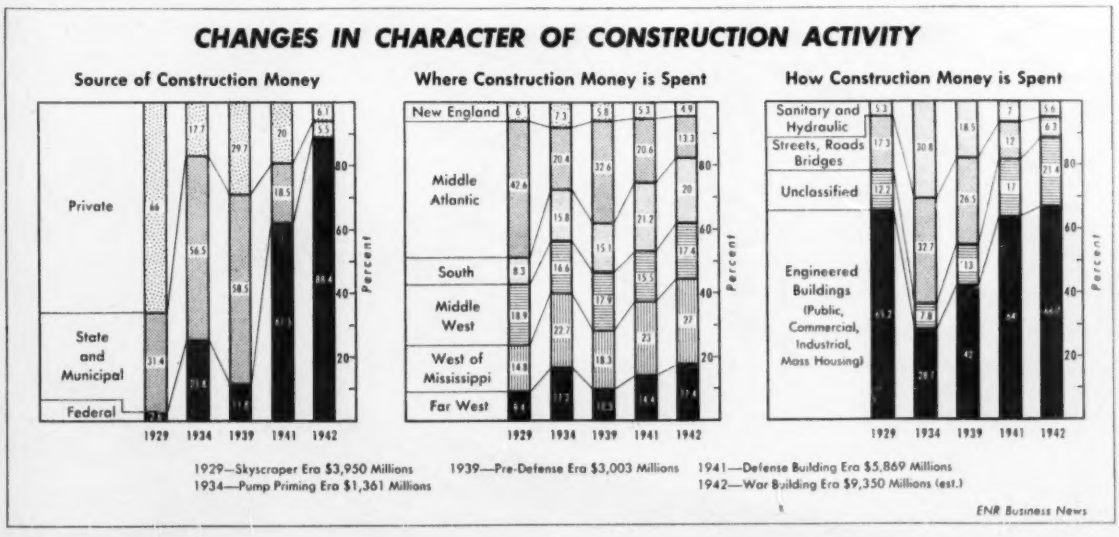
Private construction declined from its pre-war share of engineering construction, accounting for only 6.1 percent of the current total. In the defense building era, 1941, private work made up 20.0 percent of the volume, and in the skyscraper building days of 1929 it was 66.0 percent of the total.

State and municipal work was 5.5 percent of the 1942 volume, down from the 18.5 percent reported in 1941. This type of public work achieved its greatest share of construction in the pump-priming days of 1934 and 1939 when it was 56.5 and 58.5 percent of the respective annual engineering construction totals.

Almost 67 percent of the record 1942 construction was spent for engineered buildings. Public buildings—war plants, both federally-owned and operated, and federally-owned and privately-operated; military housing; war housing; etc.—accounted for the major portion, 61.3 percent. Private industrial buildings, and commercial building and large-scale private housing were 2.2 and 3.2 percent of the 1942 volume, a sharp decrease from 1929 when these two types of buildings combined to make up 58.2 percent of the total.

Unclassified construction, heavily weighted with military projects, reached $2 billion for the year, boosting its share of the volume to 21.4 percent from the 17.0 percent reported in 1941. Waterworks increased its portion of the 1942 total to 1.6 percent from 1.3 percent last year.

Geographically, West of the Mississippi states led all other sections of the nation in engineering construction in 1942. This region was responsible for 27.0 percent of the U. S. total. Far West and Middle West each accounted for 17.4 percent of the volume; South for 20.0 percent; Middle Atlantic for 13.3 percent; and New England for 4.9 percent.



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KEEP YOUR SCRAP MOVING

...TO VICTORY!

America has to dig, and dig deep to find enough scrap metal to make vital fighting equipment. Normal sources of scrap are drying up. This means that *you* and other Americans must make a sustained effort to fill the gap as long as the war lasts.

HERE'S HOW YOU CAN DO IT: Delegate someone with full authority to decide what can be scrapped. Better yet, do it yourself. Make a survey of your steel tools, equipment, machinery and materials. If there is *anything that hasn't been used for three months and if it can't be proved that it will be used in the next three months*—find a use for it or scrap it.

Half-way measures won't do. Total war demands all-out effort. Get rid of every bit of waste material you don't need. The men who are fighting our battles can't win with courage alone. Start your scrap moving and keep it moving—to Victory! Armco Drainage Products Assn., 1205 Curtis Street, Middletown, O.

This advertisement is in support of the Salvage Program of the Conservation Division of the War Production Board.

TURN IN ALL YOUR SCRAP

ARMCO

Tomorrow's Jobs will be licked with better machine advantages

Large Clutches

Splined Shafting

Crawler Gears Fully Enclosed

Simplicity of design—for easy upkeep.

"Feather-touch" Control—reduces "day-end" fatigue and increases output.

Cushion Clutch—relieves all parts under power from overload.

Worm Boom Hoist—Power up or down.

Cast Steel Bases with Cast Steel Machinery Side Frames—maintains shaft alignment.

Helical Gear Drive—trouble-free and quiet.

Uniform Pressure Swing Clutches—smooth in operation, free from grabs and jerks.

Ball or Roller Bearings—assures maximum transmission of power.

Differential Steering—Power on both crawlers while turning as well as when going straight ahead—better mobility.

Small Crawler Rollers—won't jam up in crossing rail or other obstructions.

No Nut Cracker Crawler Action—no open joints between treads to pick up stone or trash.

Chain Drive to Crawlers

Demountable Lagging—Permits quick changing of drum diameter.

Easy Convertibility—quickly changed to shovel, dragline or pullshovel for other work.

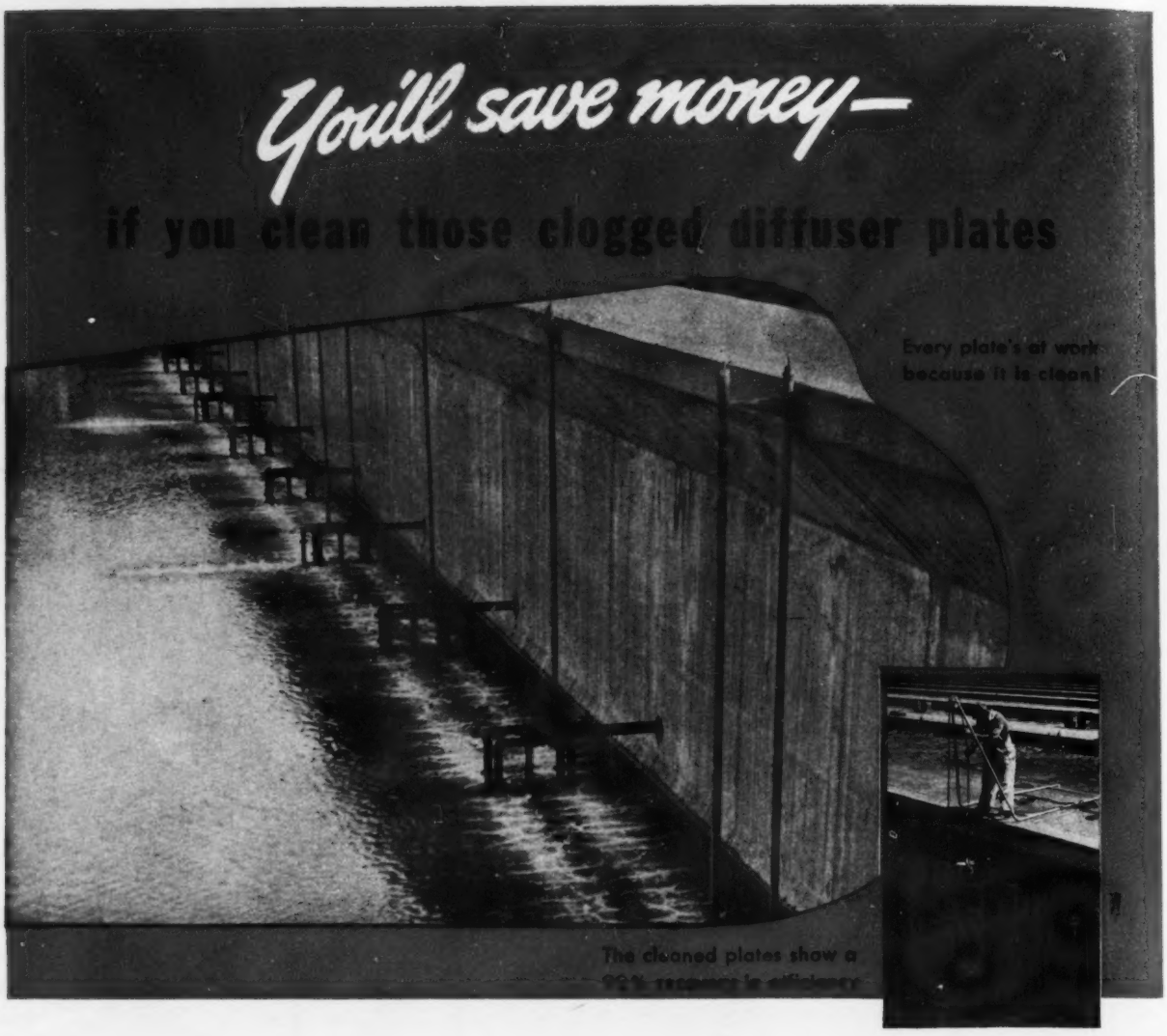
Buy for the TOUGH GOING, and the easy jobs will take care of themselves

FOR years, Northwest has been proving in the field that better machinery means lower cost operation and greater output. Now, in the emergency, talk to the men that are having experience with several makes of equipment—it's the machinery that is built to do a job—not built to a price that's coming through.

Good machinery means steady operation, few delays, low costs and a fast completion of the job in hand. Getting things done is what counts today, and tomorrow only the best will be good enough. Northwests have the advantages for today's problems—and tomorrow's. In buying for today, plan ahead.

NORTHWEST ENGINEERING CO.
1727 Steger Bldg.
28 E. Jackson Blvd.
Chicago, Illinois

NORTHWEST


You'll save money—
if you clean those clogged diffuser plates
Every plate's at work because it is clean!
The cleaned plates show a

Power costs mount rapidly as diffuser plates in a sewage treatment plant get clogged. The air pressure required to keep aeration tanks going must be stepped up, so more and more power is used to drive the blowers.

It has been demonstrated* that it is economical to remove and clean diffuser plates when clogging of these plates has caused the blower discharge pressure to increase one-half pound per square inch.

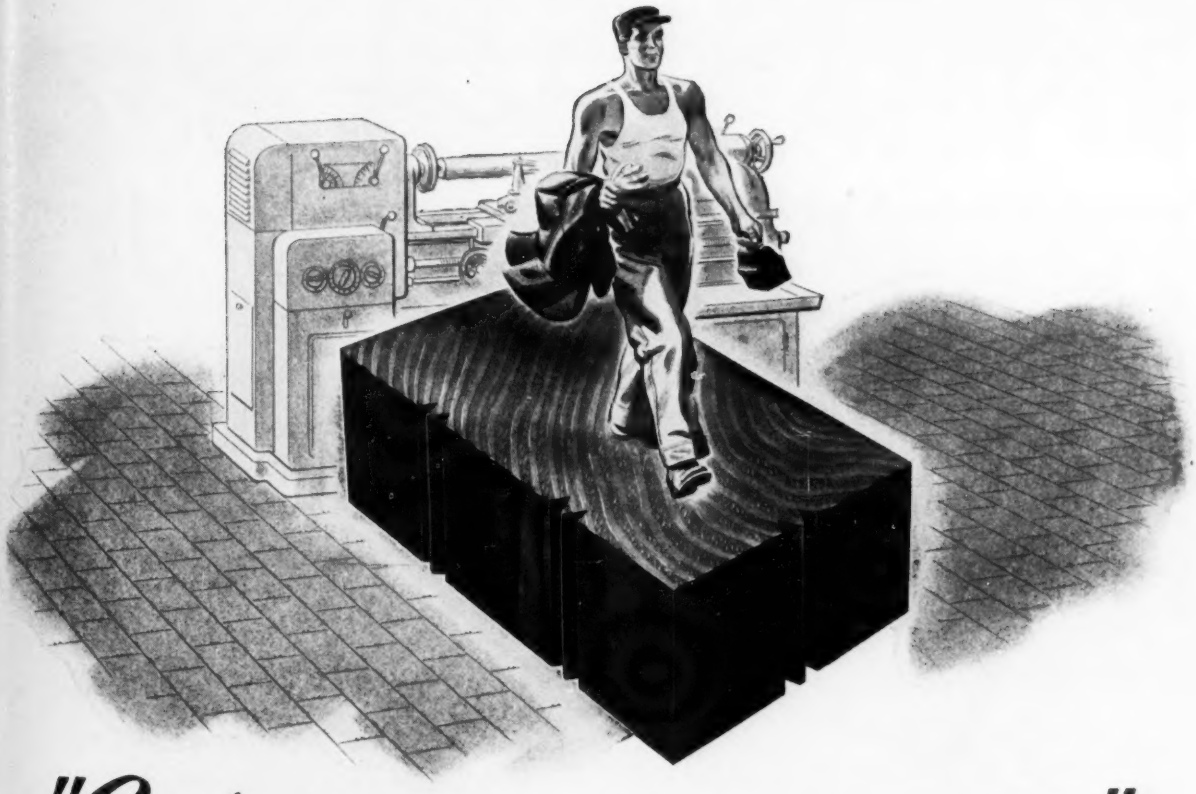
Alcoa Aluminum diffuser plateholders of the Burger type are in service where these tests were run. These holders make it possible for plates to be removed for cleaning and replaced without breakage. Rubber gaskets make the plates water and airtight. Of course, these Aluminum plateholders are not now available—all metal is going to war products—but data like these disclosed here again prove that it is wise to include Aluminum holders in postwar planning.

If you are interested in having a copy of the report on this study, we'll see that a copy is sent to you. Write ALUMINUM COMPANY OF AMERICA, 2108 Gulf Building, Pittsburgh, Pennsylvania.

. . .

**Reported in a paper by Willard F. Schade and John J. Wirts, presented at Ohio Conference on Sewage Treatment, Mansfield, Ohio, September 1941. Printed in Sewage Works Journal of January 1942.*

ALCOA ALUMINUM



"*Grit* makes men...but breaks machines"

Grit (grit), *n.* (AS. *gréot* grit, sand, dust.)
1. Determination, stamina, courage.
2. Hard, coarse grained, fit for grinding.

In *men,* grit is needed for all-out effort.

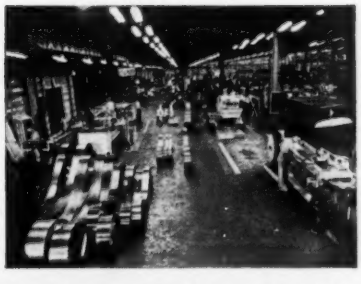
In *machines,* grit destroys precision, wastes time, costs money.

There is no abrasive dust and sand in KREOLITE Wood Block Floors to flake off and ruin vital machine bearings. KREOLITE gives you a supple surface that stands daily pounding without cracking, chipping, or disintegrating into dust. The "give" in the selected wood also saves tools and parts accidentally dropped. KREOLITE Floors help maintain even temperatures and humidity needed for precision production.

The resiliency of KREOLITE factory floors keeps workers' feet "at ease" and conserves energy for productive effort. Industrial noises and vibrations are absorbed. KREOLITE insulates floors against extreme heat, cold, dampness.

KREOLITE Wood Blocks are all tough end-grain Southern Pine, pressure-treated with KREOLITE Oil for long life. Patented lugs prevent bulging and a coating of KREOLITE *Jennite* makes a floor water and sun-proof, acid and oil resistant. KREOLITE Floors are easily spot repaired when it is necessary to move machines.

It is our responsibility to keep a Jennison-Wright flooring engineer in your vicinity. His services are available, without obligation, to study facts and figures about *your* floors.



Simonds Saw & Steel Company's windowless factory, Fitchburg, Mass., uses 116,000 sq. ft. of KREOLITE Kounter-Sunk Lug Wood Blocks to pave its controlled conditions plant.

★ ★ ★

Specify **KREOLITE...Accept No Substitute**

Comfortable to Work On • Dustless, Easy to Clean
Absorb Noise, Cut Vibration • Low Maintenance
Protect Dropped Tools and Parts • Durable
Insulate • Spark-proof, Skid-proof, Safe
Firm Base for Machines
Quick to Install, Easy to Replace

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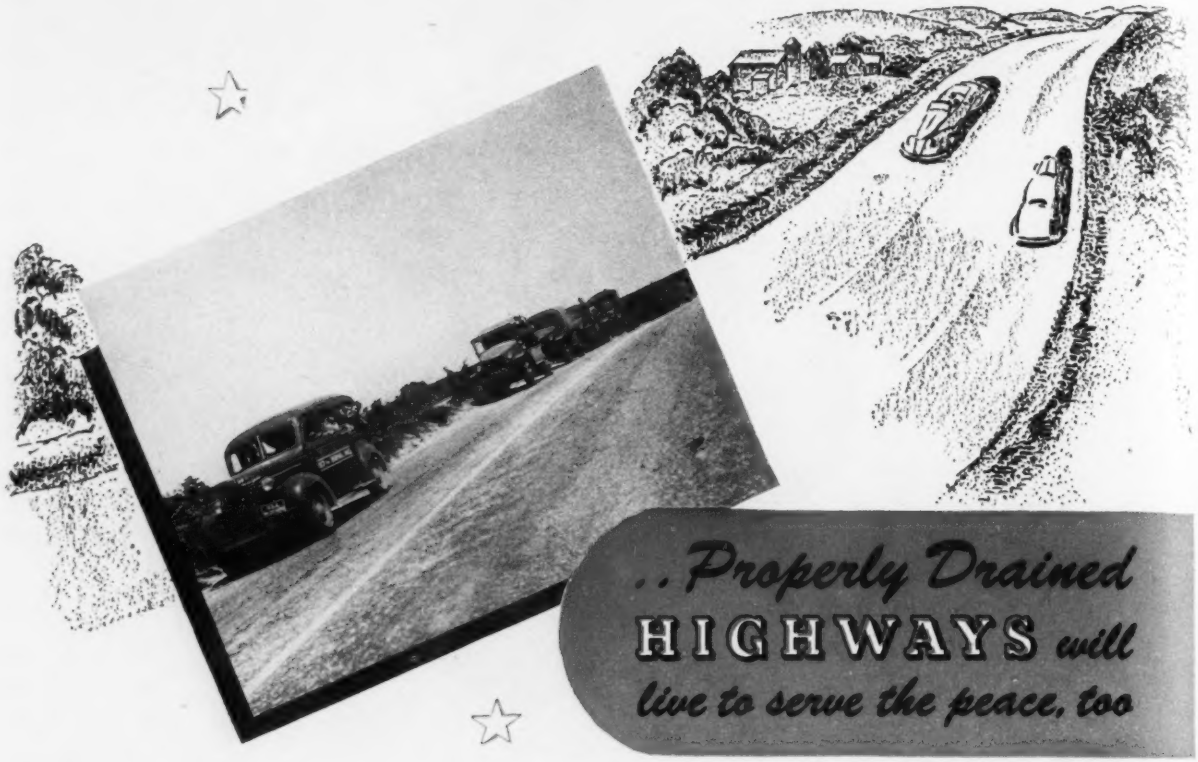
KREOLITE WOOD BLOCK FLOORS

KREOLITE RAILROAD SWITCH & INDUSTRIAL TRACK TIES • PILING • BRIDGE & DOCK LUMBER



..Properly Drained
HIGHWAYS *will*
live to serve the peace, too

THE HIGHWAYS OF AMERICA are taking a heavy pounding now as war materials are rushed by truck, night and day, to their destinations. Highways that possess adequate drainage are the ones that stand the best chance of coming through the war in good condition. Where farsighted engineers have specified Toncan Iron drainage products, highways have a still better chance of holding up under the rigors of wartime traffic.

In designing now the small bridges and highway improvements for postwar construction, remember the service that has been rendered in the past by corrugated metal pipe. When specifying drainage products, keep in mind Toncan Iron Sectional Plate Pipe and Arches for small bridges, CorWel for modern subdrainage, Toncan Iron Corrugated Pipe for long-lasting drainage. The Toncan Culvert Manufacturers Association, Republic Building, Cleveland, Ohio.

- Made of the rust-resisting Toncan Copper Molybdenum Iron... Product of Republic Steel Corporation.
- In diameters of 6" to 84".
- Meets State and Federal Specifications.

TONCAN IRON
Corrugated
METAL PIPE

- Quick, easy installations by unskilled labor.
- Strength for heavy loads ... low annual cost.
- Easily extended or salvaged for relocation.

KEEP THIS MODERN DRAINAGE PIPE IN YOUR MENTAL SPECIFICATION FILE

CONCRETE EXAMPLE

Of the internal curing properties of Anti-Hydro Gauged Concrete

AIRPORT RUNWAYS

Concrete internally cured with ANTI-HYDRO, opened to traffic in 24 hours. Saved contractor considerable time and labor, and produced strengthened and weatherproof concrete.

Anti-Hydro Conditions Concrete As Alloy Conditions Steel

INCREASED DENSITY

Increases hydration and dispersion of Portland cement—increases adhesion to steel. Reduces shrinkage and voids in concrete—cures internally and eliminates need for surface curing.

INCREASED HARDNESS

Permits opening concrete to traffic in 24 hours. Produces wear resistant and dustless surface.

INCREASED STRENGTH

Reduces water-cement ratio for specified slump. Increases early and ultimate strength with regular Portland cement (tests of U. S. Government and independent laboratories).

INCREASED DURABILITY

100% impermeable concrete (Government and independent tests). Weatherproof concrete (see freeze and thaw tests).

Concrete Runways, Aprons, Highway Intersections, Industrial Floors and Platforms can be internally cured and hardened by the addition of Anti-Hydro to the concrete mix. It speeds up construction with any standard Portland cement and eliminates the necessity for time-consuming surface-curing and hardening. It protects concrete at freezing temperatures.

Send This Coupon for A. I. A. Data Folder

GUARANTEED RESULTS

A 5-year maintenance guarantee, based on 38 years of successful performance, can be furnished on Anti-Hydro gauged concrete floors, installed under manufacturer's supervision.

"ANTI-HYDRO"
FOR PERMANENT CONCRETE
HARDENS WATERPROOFS

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NATIONALLY DISTRIBUTED by building supply dealers in all principal cities of the United States and Canada

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265 Badger Ave., Dept. A., Newark, N. J.
Please send me A. I. A. folder on Anti-Hydro.

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Firm Name_____

Address_____

City_____ State_____ A

ORDNANCE PLANT
Architect-Engineer *tells*..

GIEB, LA ROCHE, DAHL AND CHAPPELL
ARCHITECTS-ENGINEERS
TEXAS BANK BUILDING
DALLAS, TEXAS

OFFICES
DALLAS, TEXAS
TEXARKANA, TEXAS

M. B. GIEB
E. B. LA ROCHE
GEO. L. DAHL
F. W. CHAPPELL

November 28, 1942

Fiegel's Construction Company
Minneapolis, Minn.

Gentlemen:

In answer to your inquiry, I am glad to give you the following information regarding our experience with admixtures at the _____ Ordnance Depot.

We were confronted with the problem of pouring a great deal of concrete under difficult conditions. The aggregate contained large stones yet we had very close limits of clearances due to placing reinforcement to the bottom and top forms of the "igloos".

It was important that we secure a mix which would flow freely from the chutes into the forms around the reinforcement without segregation; which would produce dense concrete, free of voids and honeycombs; and which was economical.

After a number of laboratory tests, we found that by using Pozzolith in a four-sack mix we could get the 3000 lbs. of compressive strength needed, in addition to meeting the requirements on placeability and density. The reduced cement content of four sacks enabled us to maintain an economic balance of cost.

Due to the fact that the required strength was arrived at in less than normal time, we were able to speed up the operation and effect an ultimate savings. This was substantiated by facts and figures and approved by the Area Engineer.

Very truly yours,

GIEB, LaROCHE, DAHL AND CHAPPELL

By Geo. L. Dahl
George L. Dahl

GLD:LA

MASTERBUILT PRODUCTS

MASTER

...how they solved a Tough Problem

by using POZZOLITH (Cement Dispersion)

This large Ordnance Plant is typical of the 41 great defense projects in which Pozzolith has been used with amazing results. In one depot 150 "igloos" were built in the record time of 14 days!

HERE were four important requirements to meet — easy placing under extremely difficult conditions . . . dense, watertight concrete free from segregation defects . . . low total materials cost . . . and speed.

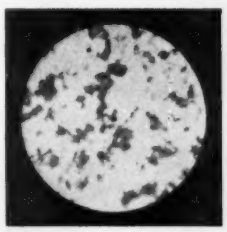
With a reputation for employing progressive methods, this architect-engineer investigated Pozzolith, and as a result of laboratory tests decided that here was the answer to their problem.

Pozzolith is not an admixture in its essential action . . . its primary purpose being to disperse the clumps of cement particles which tend to form in every mix. Millions of yards of Pozzolith concrete prove that this action (Cement Dispersion) greatly increases cement efficiency and measurably improves all concrete properties.

Write for illustrated booklet showing how Pozzolith can be used to advantage on your jobs, and Research Papers No. 36 — "Economics of Cement Dispersion" (for mass concrete) and No. 39 — "Cement Dispersion and Air Entrainment" (for runways and pavement).

THE MASTER BUILDERS COMPANY
CLEVELAND, OHIO **TORONTO, ONTARIO**

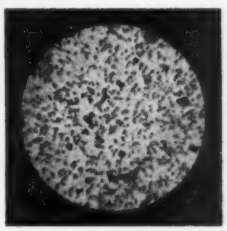
HOW CEMENT DISPERSION WORKS



Cement suspended in water
UNDISPERSED

WITHOUT POZZOLITH

In a normal concrete mix, cement particles tend to bunch together, thereby (1) limiting hydration and (2) trapping water within the cement clumps. (See photomicrograph above).



Cement suspended in water
DISPERSED

WITH POZZOLITH

Cement Dispersion drives these particles apart and (1) exposes their entire surface area to hydration, at the same time (2) making the water entrapped in the clumps available for lubrication of the mix. (See photomicrograph above).

BUILDERS

MASTERBUILT PRODUCTS

WOOD ROADMIXERS build top-quality paving faster, with less equipment, less manpower and at less cost than any other method of pavement construction!

HERE'S WHY

In the first place, the Wood Roadmixer is a complete traveling mixing plant. It is powered and pulled by a standard crawler tractor and tows a liquid binder supply truck. That's all the equipment needed to put down an airport, a landing field, a road or a highway. This means less equipment tied up, simplified operations —and ***speed!***

Second, on an average paving job with a Wood Roadmixer, two men can handle the entire operation. This cuts labor costs to a minimum and releases much needed manpower for other urgent jobs.

Third, records on completed projects, or on work now under construction in the United States and abroad, show savings as high as one-third in costs. Much of this paving was laid under conditions too difficult for other methods to handle.

These are facts that operators of Wood Roadmixers are proving every day.

Engineers and Contractors with an eye on the taxpayer's pocketbook as well as their own are turning to Wood Roadmixers—the leading traveling plant method of rapid, low-cost asphaltic pavement construction.

Write for detailed and illustrated Wood Roadmixer bulletin, "The Fastest Method of Low-Cost Paving."

WOOD ROADMIXER

Wood Manufacturing Co. • 208 West 8th St., Los Angeles, California

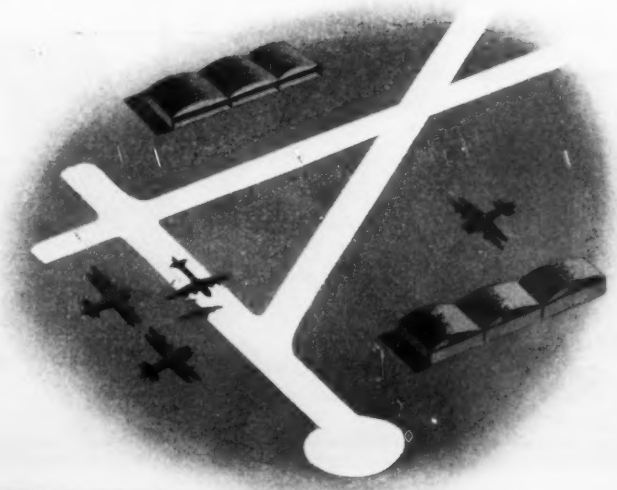
Firm Footing

FOR FLYING FORTRESSES

Coming into port! The crushing weight of these giant airships offers a strenuous test of strength to the runway under foot and challenges the endurance of an airfield's concrete flooring. Long before Pearl Harbor the Raymond Concrete Pile Company was conscripted to construct sturdy underpinning for the broad, level pathways that lead to the sky. Our air bases must not be too few, too late or too weak!

Assuring firm footing for flying fortresses is but one step in the all-out effort to win this war. Raymond men and Raymond equipment are helping to make the country strong in other fields too—laying firm foundations for important military, naval and production projects. For this is a race against time, a contest in which we are all entered and which we must win together. Speed!

THE SCOPE OF RAYMOND'S ACTIVITIES includes every recognized type of pile foundation—concrete, composite, precast, steel, pipe and wood. Also caissons, construction involving shore protection, ship building facilities, harbor and river improvements and borings for soil investigation.



RAYMOND

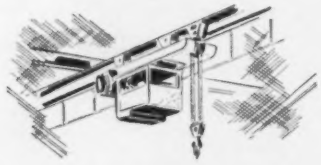
CONCRETE PILE COMPANY

140 CEDAR STREET, NEW YORK, N. Y.

Branch Offices in Principal Cities

"This 'once-over' of equipment pays off in extra wire rope life"

"If you're out to get a full measure of service from your wire ropes, it's just good, common sense to check the equipment it runs on. Not just when you get around to it, but regularly—carefully and often. Make a close check-up when a new rope is installed ...and then check again, frequently—*before* the rope starts to show signs of wear. Take a crane for example, with a worn sheave.



It will go right along handling every bit of work it always did. But that sheave will cut and squeeze the wires ...and the rope will be through, long before its time.

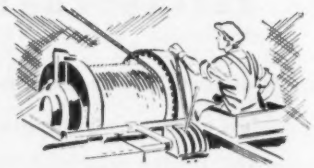
Here are some of the things to look for—some of the reasons why you often hear an operator blame the rope when it was really his own equipment that shortened its life.

First, see if any sheaves are out of alignment. Then check for deeply worn grooves with a gauge,—like this...

The grooves may be scored by an old rope or one of them may have a broken rim that calls for replacement. Sheaves may turn hard or wabble because of worn or damaged journals. That's tough on your ropes, too.

It's easy to realize the jerk or shock at the fastening when a wire rope whips. Vibration has the same kind of effect, building up a great many small shocks. Too much play in the rope may be to blame...even a bent shaft.

Check for displaced or faulty rope guards. Then find out from the operators if there are any clutches that stick or grab...loose bearings or anything else that causes the pull on a rope to be uneven or jerky.



And remember to consult your wire rope manufacturer on any special problems. There are local representatives near you who have practical experience in ferreting out any "bugs" in your equipment that may be keeping your wire ropes from delivering a maximum of service."

JOHN A. ROEBLING'S SONS COMPANY
TRENTON, NEW JERSEY
Branches and Warehouses in Principal Cities

ROEBLING
"Blue Center"
STEEL WIRE ROPE
PREFORMED OR NON-PREFORMED

America Has A New "Main Street!"

It's the Alaska-Canada Highway, but it's Main Street for it's the *main* reason why the Japanapes won't rename it "Alaskakuo" and set up a puppet emperor over it.

You'll find Buckeye Clippers—the convertible shovels with vacuum power control—working along Main Streets in cities all over America and in gravel pits, material yards and on excavating jobs just off Main Street. And Buckeye Clippers made the dirt fly on America's new "Main Street." Subarctic weather is their meat—extreme heat or cold doesn't affect *vacuum control.*

Model 70 3/4 yd. Clippers were used, one of which is shown above. They're on many other vital war projects, too. It's Vacuum Control for Victory!

BUCKEYE TRACTION DITCHER CO.
"Part of the Arsenal of Democracy"
Findlay, Ohio

It's a people's war .—defend your Liberty by buying war bonds.

How to Make Your Shovel Last Longer!

1. Keep dipper teeth sharp. (Saves fuel, oil and maintenance; increases production.)
2. Keep all parts well lubricated and clean. Accumulation of dirt gets into the moving parts and causes excessive wear and damage.
3. Don't abuse your shovel—lifting loads beyond its capacity—piling on extra counterweight—careless and rough operation.
4. Don't allow cables to cross wrap on the drum.
5. Keep crawler treads adjusted properly.
6. Don't use abrasive material on clutches and brakes. If grease gets on the linings, clean with gasoline.
7. Keep all joints on the vacuum system tight.
8. Change the oil in the motor crank case regularly.
9. Clean air cleaner regularly.
10. Use clean water in the radiator—flush it out occasionally.

Built by Buckeye

Convertible Shovels

Trenchers

Tractor Equipment

R-B Finegraders

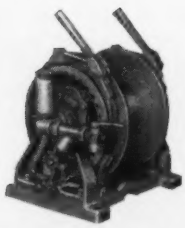
Road Wideners

Spreaders

A job . . .

PORTABLE COMPRESSOR

Stands up under continuous heavy-duty service without attention, without trouble or repairs. Simple, accessible design. Highest grade engineering throughout. Makes use of most advanced metallurgy. Economical. The unqualified leader in its field.



"TURBINAIR" HOIST

The F-113 is powered by the amazingly simple, extremely powerful Sullivan "Turbinair" motor. Light, rugged and compact, the F-113 is easily moved to any location that will support the load. Alloy construction increases production through longer life and less frequent "time-outs" for repairs.

SULLIVAN

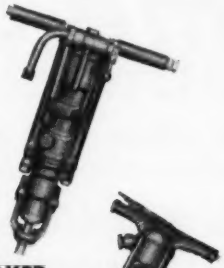
Contractors Equipment proved the World Over

. for every Contractor

EVERY man who makes or builds anything for the war effort has a job on his hands today. What happens when the Americans meet Hitler head on will depend on what the builders are doing today...how fast they are working, how soon they can complete their job, how well it will be done.

There's every reason in the world for you to employ the fastest construction equipment you can possibly get. We need more miracles of the Henry J. Kaiser kind. There's every reason to use equipment that is the most resistant to trouble, needs fewest repairs, is simpler to service. That's one way of gaining precious hours in the race with time.

There's every reason why Sullivan Air Compressors and Air Tools are being shipped in such huge quantities to crucial and critical construction projects...because Sullivan builds better performance into them...by means of better materials, better workmanship, better design. If you want the specific metallurgy, if you want the design and construction details of Sullivan equipment...or if you want simple proof of performance, contact your nearest branch office . . . SULLIVAN MACHINERY COMPANY, Michigan City, Indiana. *In Canada:* Canadian Sullivan Machinery Co., Ltd., Dundas, Ontario.



L-57 ROCK DRILL

Ease of holding, fast drilling speed and powerful blowing qualities make the L-57 the leader in its class. Exclusive Sullivan "Dual-Valve" construction creates a "controlled cushion" at both ends of piston stroke.

K-81 PAVING BREAKER

A heavy weight breaker designed for the heaviest work. Simple, clean design. Rugged, forged steel alloy construction. Reduced vibration. Fast, heavy blow. Exclusive "Dual-Valve" economizes on air.

UNIVERSAL MEDIUM WEIGHT WAGON DRILL

Sturdy, "A" frame construction supports weight of drilling mechanism. Positive locking friction brakes. Hydraulic feed for quick, easy positioning of supporting arm. Drills in any position. Easily moved, saves time on set-ups.

SULLIVAN BRANCH OFFICES

BIRMINGHAM, ALA...619 N. 10th St.
BOSTON, MASS...104 Brookline Ave.
BUTTE, MONT.....24 W. Granite St.
CHICAGO, ILL. 307 N. Michigan Ave.
CLAREMONT, N. H.....1938 Main St.
DALLAS, TEX.....1914 Commerce St.
DENVER, COLO...1815 California St.
DULUTH, MINN...1 East Michigan St.
EL PASO, TEX...117 North Kansas St.
HUNTINGTON, W. VA...728 8th Ave.
KNOXVILLE, TENN.
201 Medical Arts Bldg.
LOS ANGELES, CALIF.
2900 Santa Fe Ave.
MIDDLESBORO, KY...501 No. 19th St.
NEW YORK CITY, N. Y...30 Church St.
PITTSBURGH, PA.
47 Terminal Way, So. Side
PORTLAND, ORE.
1631 N. W. Thurman St.
SALT LAKE CITY, UTAH
117 W. 2nd South St.
SAN FRANCISCO, CALIF.
145 Tenth St.
SEATTLE, WASH.
3410 First Ave. South
ST. LOUIS, MO.....2639 Locust St.
WASHINGTON, D.C. 1427 I St., N. W.

SUPPOSE

He Took "Time-off"..

The doughboy stays at his post come hell or high water. He knows his duty and he does it.

To shirk that duty would mean defeat, even death—and disaster for all of us.

But he cannot carry on the fight alone. He must have guns, ammunition, supplies.

That is our job!

Unnecessary "time off" means lost ships, guns and shells—lost just as surely as if they were destroyed by our enemies in battle.

Stand by our fighters—stay on the job until the fight is won!

We will be pleased to send you poster size, three-color reprints of this ad, without signature for your own use.

INLAND STEEL CO.

38 S. DEARBORN ST., CHICAGO, ILL.

Sales Offices: Milwaukee, Detroit, St. Paul, St. Louis, Kansas City

WHERE TO BUY

Featuring additional products, specialties, and services for the Construction Industry

IMMEDIATE DELIVERY

With "Preference Rating"

UNIVERSAL Level-Transit

Telescope 12" long, 25 Power—Horizontal Circle 4½" with vernier to 5 minutes—Vertical Arc 3"—Instrument weighs 11 pounds, tripod 9 pounds.

Price complete with Tripod, Carrying Case, Sunshade, and Dust Cap $115.00, plus Federal Excise Tax $4.00. Can be furnished with a compass at $12.50 extra.

ORDER BY MAIL

Expert Repairing of All Makes of Instruments

FREE INTERESTING BOOK—"HOW TO LAYOUT BUILDING LOTS"—FREE—WRITE TODAY

DAVID WHITE COMPANY 305 W. Court Street Milwaukee, Wisconsin

This
WHERE TO BUY
Section

Supplements other advertising in this issue with these additional announcements of products and services essential to efficient and economical operation in the construction field. Make a habit of checking this page, each issue.

Departmental Staff
ENGINEERING
NEWS-RECORD

THE MOST FOR THE MONEY — *SPEED - EFFICIENCY - ECONOMY*

CONSTRUCTION BY CONTRACT

THE ASSOCIATED GENERAL CONTRACTORS OF AMERICA, INC. - MUNSEY BLDG., WASH. D.C.

ENGINEERING NEWS-RECORD'S CONSTRUCTION DAILY—

Will give you the vital information you need to sell to hundreds of large and small construction jobs throughout the country, frequently days ahead of other sources. It also gives names and addresses of owners, engineers, and contractors.

Locate the largest projects (marked ★), the most active territories, the business to go after first—and forward the information to salesmen or distributors for follow-up. All projects are listed geographically classified by type of work and status (proposed work, bids asked, low bidders, contracts awarded). The cost: $10. per month—by Air Mail, $11.

ENGINEERING NEWS-RECORD CONSTRUCTION DAILY, 330 W. 42nd St., New York, N. Y.

SEARCHLIGHT SECTION

EMPLOYMENT • BUSINESS • OPPORTUNITIES • EQUIPMENT—USED or RESALE

UNDISPLAYED RATE:

10 cents a word, minimum charge $2.00.

POSITIONS WANTED (full or part-time individual salaried employment only). ½ the above rates, payable in advance. (See ¶ on box Numbers.)

PROPOSALS, 50 cents a line an insertion.

INFORMATION:

BOX NUMBERS in care of any of our New York, Chicago or San Francisco offices count 10 words additional in undisplayed ads.

DISCOUNT of 10% if one payment is made in advance for four consecutive insertions of undisplayed ads (not including proposals).

DISPLAYED—RATE PER INCH:

The advertising rate is 6.90 per inch for all advertising appearing on other than a contract basis. Contract rates quoted on request.

AN ADVERTISING INCH is measured ⅞ inch vertically on one column, 3 columns—30 inches—to a page. E.N.R.

NEW ADVERTISEMENTS received by January 8th appear in January 14th issue subject to limitations of space available

WANTED

INSTRUMENT EXPERT

By leading aircraft engine manufacturer in East. Engineering training and calibration experience required although not necessarily in aircraft engines. Must be able to devise new and more nearly accurate methods of temperature and pressure measurement and to improve existing methods. No applications sought from persons employed in war production.

P-171, Engineering News-Record
330 West 42nd St., New York City

WANTED

RESEARCH ENGINEER

with practical experience, originality and creative ability to head research and development with company manufacturing heavy conveyor equipment. Permanent position to qualified applicant.

P-249, Engineering News-Record
520 No. Michigan Ave., Chicago, Ill.

POSITIONS VACANT

These Positions Vacant advertisements are published subject to agreement by the advertisers not to consider applicants now employed on war work unless they obtain written release from present employer.

EMPLOYMENT SERVICE

EXECUTIVES AND TECHNICAL MEN. Qualified candidates desiring $2,000 to $20,000 positions may contact employers through our confidential services. Established 27 years. The National Business Bourse, 20 W. Jackson Blvd., Chicago.

POSITIONS WANTED

CIVIL ENGINEER; Graduate; 33 years experience; design, construction; Industrial plants; Water supply; Hydro-electric developments. PW-36, Engineering News-Record, 330 W. 42nd St., New York, N. Y.

STRUCTURAL Engineer, graduate office engineer, New York City, completing third defense project designing steel, timber, concrete. PW-183, Engineering News-Record, 330 W. 42nd St., New York, N. Y.

CONSTRUCTION SUPERINTENDENT 20 years varied experience. Have proven record of ability to get difficult work completed rapidly and economically. Best references. Location immaterial. PW-224, Engineering News-Record, 330 W. 42nd St., New York, N. Y.

CONSTRUCTION SUPT. and Estimator. Highly experienced in Detailing, Pre-Cutting, Pre-Fabrication and Erection Gov. frame buildings. All types. Thoroughly capable in Office or Field. PW-232, Engineering News-Record, 330 W. 42nd St., New York, N. Y.

EXECUTIVE. Superintendent of construction field operations, buildings, bridges, water works, etc., available immediately. PW-237, Engineering News-Record, 330 W. 42nd St., New York, N. Y.

GENERAL SUPERINTENDENT or project manager 25 years experience on all kinds of light and heavy structures recently in charge of low cost and Defense Housing also Airport Bases location immaterial, can manage more than one project. PW-235, Engineering News-Record, 330 W. 42nd St., New York, N. Y.

A COURSE OF INSTRUCTION BY MAIL IN

STRUCTURAL ENGINEERING

Thirtieth Year

(In the following list, Courses A, B, and C are abbreviated from our complete Structural Engineering course).
A—Public Works Structures.
B—Architectural Engineering.
C—Special Course (State Board Exams, for P.E.)
D—Structural Engineering (complete)
E—Preparatory Course (for non-technical men).

Our Courses are offered principally to

ADULT CIVIL ENGINEERS AND ARCHITECTS

Ninety percent of our engineering students are former graduates (C.E.) from engineering colleges. Our courses have helped thousands of engineers to better positions, increased pay, and success "after forty".

Course B has helped many architects and draftsmen in passing the structural portion of State Board Examinations for license.

Literature sent without expense or obligation. **WRITE TODAY.**

WILSON ENGINEERING CORPORATION

College House Offices Harvard Square Cambridge, Mass., U. S. A.

SALARIED POSITIONS

This advertising service of 33 years' recognized standing negotiates for high salaried supervisory, technical and executive positions. Procedure will be individualized to your personal requirements and will not conflict with Manpower Commission. Retaining fee protected by refund provision. Identity covered and present position protected. Send for details.

R. W. BIXBY, INC.
272 Delward Bldg., Buffalo, N. Y.

POSITIONS WANTED

CIVIL ENGINEER—Experienced Executive in charge of design and field supervision since 1938. Preceded by ten years of basic design experience. Projects include industrial buildings, water works, railroads and tunnels. Located in South. Desire key position in permanent organization or will consider offer as manufacturers representative. PW-251, Engineering News-Record, 330 W. 42nd St., New York, N. Y.

CONTRACTOR'S ENGINEER and superintendent. 16 years experience. Location secondary. Available mid-January. PW-252, Engineering News-Record, 330 W. 42nd St., New York, N. Y.

CONSTRUCTION ENGINEER, 34, graduate Civil Engineer, Contractors Engineer, Superintendent, and Estimator, Building and Engineering construction. Energetic, capable organizer. Location immaterial. PW-247, Engineering News-Record, 520 N. Michigan Ave., Chicago, Ill.

CONTRACTORS ENGINEER, 50, experienced office and field as engineer, foreman, supt. roads, bridges, dams, industrial and chemical, lately powder plants and cantonments. Hard worker, cooperative, best health, know cost cutting methods. Howard Carley, Apt. 614, 4108 North Kenmore, Chicago, Ill.

WORK WANTED

ENGINEERING ORANIZATION AVAILABLE for design, supervision or field survey service. Old established concern with current experience on five large War Department projects including airports, warehouses, buildings, roads, railroad facilities, sewerage, water supply and utilities. Ample survey equipment and personnel. Fee or contract basis. Address WW-227, Engineering News-Record, 520 N. Michigan Ave., Chicago, Ill.

LANDSCAPE SUPERINTENDENT, available after Dec. 26th, with gang experienced men, specializing planting Defense Housing Projects. will consider contracting labor for this type work in Southern States during winter months. Also equipped to handle large sodding contracts. WW-244, Engineering News-Record, 330 W. 42nd St., New York, N. Y.

PATENT ATTORNEYS

PATENTS, TRADE-MARKS, Booklet, "General Information Concerning Inventions and Patents" and "Free Schedule" sent without obligation. Established 1915. Lancaster, Allwine & Rommel, Suite 454, 815 10th St., N. W., Washington, D. C.

(Continued on opposite page)

POST WAR WORK WANTED

Company with large machine shop facilities, consisting of both heavy and light machine tools, and also gray iron foundry, is looking for something to build in Post-War period. Heavy equipment preferred as addition to present line. Not interested in machine tools. Invites correspondence from designers. If you have practical idea and need assistance, address

CW-250, Engineering News-Record
520 No. Michigan Ave., Chicago, Ill.

NOTICE

Contractors we lay and finish concrete slab floors of all grades. We specialize on heavy duty concrete floor construction. We use vacuum process. Our concrete slab can be striped in 3 days after finished. All work guaranteed. Will furnish all union masons. Go any place in U. S. A. Sub. or by day work. Big production.

Call or Write
NORTH SHORE CONCRETE CONST. CO.
#20 East 4th St. Huntington Sta. N. Y.
Wm Henderson, Mgr.

EARTH HAULING EQUIPMENT

Contractor completing contract January open for negotiating or subletting a dirt hauling contract, or will consider renting complete outfit consisting of

1—95 Northwest Dragline
6—Cummins diesel 13 cu yd fluid drive Euclid Wagons
1—#12 Caterpillar Motor Patrol
1—D-8 Caterpillar Tractor and Bulldozer
1—LeTourneau Sheep Foot Roller

Complete with necessary service and maintenance equipment.

All equipment and rubber in first class condition.

M-245, Engineering News-Record
520 No. Michigan Ave., Chicago, Ill.

Watch—
the *Searchlight Section*
for
Equipment Opportunities

SEARCHLIGHT SECTION

FOR SALE

(Continued from opposite page)

BLUE PRINT MACHINE: Model twenty Pease Peerless Printer with washing and drying attachment. W. B. Adams, Box 2089, Richmond, Virginia.

FOR RENT

ENGINEERS TRANSITS and levels for rent. $20 per month. Daniel McFarland, Box Y, Antioch, Calif.

WANTED

TRANSITS AND LEVELS, new or used, top prices paid cash. O. Griner, 920 Oak St., Kansas City, Mo.

MISCELLANEOUS

ENGINEER leaving Philadelphia B & O—Flew to Birmingham August 1, 1941—Communicate, M-253, Engineering News-Record, 330 W. 42nd St., New York, N. Y.

ANYTHING within reason that is wanted in the field served by Engineering News-Record can be quickly located through bringing it to the attention of thousands of men whose interest is assured because this is the business paper they read.

FOR RENT OR SALE
ONE BROWN HOIST
STEAM CATERPILLAR CRANE
equipped for Pile Driving, Spliced Boom for 30, 40, 50 foot. Trolley Line for Bucket Work.
Young Foundation Corporation
1819 Broadway New York City

FOR IMMEDIATE RENT
1—Lorain 40 Gasoline Backhoe, ¾ yd.
1—Lorain 40 Truck Crane on 6 pneum. Wheels, 30' boom & ½ yd clamshell bucket.
BENDIX MACHINERY CO., INC.
401 BROADWAY, NEW YORK
Tel: Canal 6-5693

FOR RENT
Kohler Electric Plants
For Emergency Lighting & Power
12—1500 Watt 110 Volt Kohler
2—5000 Watt 110 Volt Le Roi
2—2000 Watt 110 Volt Kohler
HOLTKAMP ELECTRIC SERVICE
Phone 2500 Centralia, Illinois

FOR RENT
Lorain 75 Shovel Crane & Backhoe
Cletrac 35 Bulldozer Gas
1—110 Volt—15 Amp Electric Hammer
Model 204 P & H Crawler Crane 40' Boom
2—¾ cu. yd. Clamshell Digging Buckets
A. C. Contractors Machinery, Inc.
813 Allerton Avenue New York City
Phone Olinville 2-8281

FOR RENT
1¼ yard Lorain Backhoe attachment with 42" & 36" bucket.
1¼ yard Lorain shovel bucket
¾ yard Crane with 50 foot boom
50 ton Rogers full trailer
(5) Sterling dump trucks (5 cu. yd. bodies)
DOOLEY BROS. INC.
39 George Street Roxbury, Mass.

FOR SALE OR FOR RENT
CRANE
15 Ton Industrial Brownhoist eight wheel MCB steam locomotive crane 50 foot boom now in operation near Youngstown, Ohio.
Magnetic Realty & Construction Co.
742 N. Jackson St. Milwaukee, Wis.

FOR RENT
1¼ yd. Lorain Shovel 75B
1 yd. Northwest shovel or crane Model 4 Grader No. 10 Auto Patrol
Allis Chalmers Bulldozer Model HO
5—2½ yd. Dump Trucks
"Will Consider Any Sub-Contract Work"
V. J. COSTANZI, INC.
1-3-5-7 Brookside Ave. Poughkeepsie, N. Y.

COMPLETE STONE CRUSHING
or
SAND and GRAVEL PROCESSING SERVICE
available on tonnage basis
We will install NEW, MODERN portable or semi-portable plant in any practical location. Capacities 100 to 150 Tons of stone per hour or 150 to 200 Tons of sand and gravel per hour.
ESTIMATES FURNISHED WITHOUT OBLIGATION
Address
Contractors Service Corp.
Box 579, Harrisburg, Pa.

TENTS
Don't Stop Production
Continue To Pour Concrete When the Snow Flies
Use a BARCO Tent to Protect Your Job
3 Square End Tent, 40' x 60' $450.00 up to $750.00 with poles, walls, complete
1 Bale Ring Tent 40' x 120', white 12 ounce canvas with walls, poles, complete $1600.00
1 Bale Ring Tent, 12 oz. white canvas, 60' x 165', with 9' walls and poles, complete. Two extra extensions for sides makes tent 80' wide x 165' long. All for only $2450.00
All equipment subject to prior sale, so order at once!
BARNETT CANVAS GOODS & BAG CO., INC.
Manufacturers 131 Arch St., Phila., Pa.

DRAGLINES—CRANES
5 Large 8-yd. Steam 175' Boom
STRIPPING EQUIPMENT
Rent, Sale or Contract
LEWIS-CHAMBERS CONSTRUCTION CO., INC.
1402 Carondelet Bldg. New Orleans, La.

DIESEL ENGINES WANTED
1500 HP in one or more units with or without Generators. Single unit preferred. Give full information.
W-254, Engineering News-Record
330 West 42nd St., New York City

WANTED
TANK
One Steel Storage Tank suitable for Ground Stone. Capacity: 40,000 to 50,000 cubic feet.
THOMASVILLE STONE & LIME CO.
Thomasville, Pa.

WANTED TO BUY
1 CRANE OR SHOVEL
¾ or 1 yrd.
Send Bill to
I. IACONELLI
114 N. Georgia Ave. Atlantic City, N. J.

CITY OF TAMPA
INVITATION FOR BIDS

Bids: February 1st.

Pursuant to Resolution of the Board of Representatives, No. 7587-B, dated October 20, 1942, sealed bids will be received by the Mayor of the City of Tampa, in the Office of the Mayor, third floor, City Hall, Tampa, Florida, until eleven o'clock A. M., Monday, February 1, 1943, then and there to be publicly opened and read for the sale of the following equipment, located at Highland and 7th Avenues in the City of Tampa, Florida, same to be dismantled by the purchaser and moved within 45 days from acceptance of bid.

2—Erie City and 1 Schofield 150-HP, H.R.T. used boilers, 72" diameter by 18 feet long with 60 4½" No. 9 guage tubes, shell ½" plate, triple-riveted, butt-strap joints, 56 feet of steel breeching with dampers, and one 90-degree bend. Furnaces with grate bars suitable for coal or oil fuel.
3—Tate-Jones Oil Burners.
3—Crane 250# Stop-Check Main Steam Valves.
3—Crane 4½" Safety Valves.
3—Brass Feed Pipe with 250# Checks and 6 Feed Valves.
3—Pittsburgh Safety Water Columns.
47—New 4½" Boiler Tubes for above Boilers.

No bid will be considered unless same is accompanied by a certified check in the amount of 5% of the amount bid, and the successful bidder is to execute bond for an amount equal to his bid indemnifying the City from any loss, damage or liability in the removal of the equipment. Bidder is to make payment for material within six (6) days from notification of acceptance of his bid by the City.

The City of Tampa reserves the right to reject any or all bids, and the unsuccessful bidders will have their certified check returned within 10 days from opening of bids.

Dated this 21st day of December, A. D. 1942.

R. E. L. CHANCEY,
Mayor of the City of Tampa, Florida.

INSTRUCTIONS TO BIDDERS:

In submitting your bid, kindly enclose same in *sealed* envelope and mark plainly on the outside of envelope as follows:

"BID COVERING THREE USED BOILERS AND AUXILIARIES OF THE CITY OF TAMPA, WATER DEPARTMENT" TO BE OPENED 11:00 A. M., FEBRUARY 1, 1943.

Address your bid to Hon. R. E. L. Chancey, Mayor, City Hall, Tampa, Fla.

WANTED
5—¾-yd. Gas Crawler Cranes
3—½ to ¾-yd. Gas Backhoes
5—15 to 25-ton cap. Crawler Cranes
3—½ to ¾-yd. Gas Shovels
4—1½ to 2-yd. Diesel Shovels
5—6 to 15-ton Cap. Truck-Cranes
GREY STEEL PRODUCTS CO., INC.
74 Central Ave., Glen Rock, N. J.
Tel. Ridgewood 6-2275

WANTED
FAIRLEADS
One set for 1½ yd. Model 6 Northwest dragline.
RUBY LUMBER CO.
Madisonville, Ky.

SEARCHLIGHT SECTION

BINS

1—220 ton, all steel, 4-compartment with scales and batchers.
1—100 Bbl. Blaw Knox Bulk Cement Bin.

BOILERS

1—400 H.P. Water tube, ASME 200 lbs. pressure.
1—100 H.P. Locomotive type.

CARS

1—Jordan, all steel, Spreader Car, standard gauge.

COMPRESSORS

1—Ingersoll Rand 4500 ft. capacity, steam operated.

CONVEYOR

1—36" x 800 ft., complete with all mechanical parts and belt. Idlers roller bearing type.

CRANES, OVERHEAD ELECTRIC

1—36 ft. span, 10 ton, 4 motor, bucket operating, 220 volt, D.C.

CRANES, CRAWLER

1—P & H Model 206, ¾ yd.
1—Northwest model 105 Shovel and Crane.
1—O & S ½ yd., with double drums, 50 ft. boom.

LOCOMOTIVE CRANE

1—American Hoist & Derrick 15 ton, standard gauge, gasoline powered, for sale or rent.

CRUSHER SPECIALS

1—Reliance 14 x 24 all steel.
1—New Holland 7 x 12.
1—Champion 9 x 15.
1—Cedar Rapids 9 x 36.
1—Telsmith 16-A.
2—Allis Chalmers 6" and 10" Superior.
3—Traylor 12" and 16" gyratory.
1—Buchanan and 1—Farrel 13 x 30.
1—Symons 2' and 3' Cone Crushers, coarse bowl.
1—Allis Chalmers 36 x 42, used only three months.

ROLL CRUSHERS

1—14 x 30 Traylor.
1—24 x 24 Link Belt, single roll.

GYRATORY CRUSHERS

All standard makes Size No. 4, openings 8 x 30 to Size 21, openings 42 x 134".

JAW CRUSHERS

8 x 16 up to and including 60 x 84.

BOOT BUCKET ELEVATOR

1—Link Belt, motor driven, steel housing, size 15" x 42" x 30' high, style No. 2C, serial No. W-7001, complete with No. 88 Link Belt chain and 4" x 6" buckets with K-1 bucket attachments.

DRYERS & KILNS

1—7' x 55' single shell.
1—5' x 42' single shell.
1—8' x 7' x 80' Kiln.

HOISTS & DERRICK

1—125 H.P., 3 drum, with separate swinger and stiff leg derrick; also, one 80 H.P. double drum, electric.

LOCOMOTIVES

1—American, 40 ton, 4 wheel, std. gauge, saddle tank, cylinders 14 x 22, 190 lbs. working pressure, ASME boiler. For sale or rent.
2—Vulcan 32 ton, 4 wheel, std. gauge, saddle tank, air brakes.
1—Vulcan 21 ton, steam, air brakes, std. gauge.
1—Ironton 7 ton, trolley type, 36" gauge.
2—Ironton 3½ ton, storage battery, 36" gauge.
1—American 14 ton, steam, saddle tank, 36" gauge.

TRUCK MIXERS

5—1¼ yd. capacity, Jaeger, separate engine drive on 1940 Fords and 1936 Mack trucks.
1—Jaeger 5 bag Mixer on skids, 60 H.P. gasoline motor.

PUMPS

1—12" Morris Dredge Pump, belt drive.
1—4" Centrifugal 100 H.P., A.C. motor, 710 GPM, 350' head.
2—12" Centrifugal Pumps, cap. 5000 GPM, 125' head, 300 H.P. A.C. motor.
1—6" Underwriters Fire Pump, 125 H.P. A.C. motor.
1—6" Centrifugal 75 H.P. A.C. motor, 800 GPM, 226' head.
1—10" Centrifugal all bronze 3000 GPM, 200' head.

WE WILL BUY ANY MODERN PIECE OF EQUIPMNET ANYWHERE

A. J. O'NEILL
Lansdowne Theatre Bldg.
LANSDOWNE, PA.
Philadelphia Phone: Madison 8300

3—Monighan 3 yd. Draglines.

2—27E KOEHRING PAVERS

STEEL TANKS

54 Tanks 5,000, 10,000, 15,000 and 22,000 gal cap.
2—10,500 Bbl., Field Tanks 50'x30'.

SHOVELS

¾ Yd. Bay City 16B
½ Yd. Byers Backhoe & Crane
½ Yd. Osgood Backhoe
1 Yd. Thew 57 Elec. Tunnel
2—Gardner GD9H Air Shovel
6 Yd. Bucyrus 200-B Steam
1¼ Yd. 41B Bucyrus Steam
5—¾ & 1 Yd. Erie Steam
1—¾ Yd. Marion 32 Steam

CRANES—DRAGLINES

3W & 4W Monighan Diesel Draglines
20 Ton American Loco. Crane
1½ Yd. 41B Bucyrus Steam 50 ft. Boom Crane & Shovel.
1 Yd. K35 Link Belt 50' Boom
3 Yd. Osgood 60' Boom Diesel Dragline

TUNNEL EQUIPMENT

2 ROOTS Blowers 24x60, 200-H.P.
7 CONWAY Muckers 20A, 30A, 50A, 60A & 75
2 KOPPLE Jumbo Drill Carriages
110 TUNNEL Cars 1, 2, 4, & 5 yd. cap.
120—Battleship Buckets & Stone Skips
18 Battery Locomotives 3, 5, 6 & 8 ton
2 INGERSOLL RAND 54 & 40 Sharpeners

AIR COMPRESSORS

110-315, 420, 603, 1,000 Ft. I-R Diesels
110, 160, 220, 310 & 1300 Gas, Portable
1—676', 870' & 1350 Ingersoll Rand XCB Bltd. 676 ft., 1300 ft., 1572 & 2850 Ing. Rand Elec. Low Pres.: 743, 1200, 1500, 2600 & 5600 ft.

WHIRLEY CRANES

4—AMERICAN 685 & 1085—100 ft. Booms
2—DAYTON GANTRY 100 ft. Boom, Electric
2—CLYDE WILEY 85 to 100 ft. Booms

CRANE & SHOVEL ATTACHMENTS

⅜ Yd. P & H 300 Shovel Front
¾ Yd. NORTHWEST Pull Shovel Front
1¼ Yd. NORTHWEST Gas Shovel Front
1¼-41B Steam Shovel Front
1¼ yd. KOEHRING 601 Shovel Attachment

TRUCK CRANES

6 Ton UNIVERSAL Mack on Pneumatic Tires
7½ Ton LORAIN Model 40 on Pneumatics

STEEL DERRICKS

75 Ton Stiff Leg, 135' Boom
5 Ton Steel Stiff Leg 40 Ft. Boom
2—Clyde 15 Ton Stiff Leg 100 & 125' Boom
2—Terry 25 Ton 100' Boom Guy Steel Erectors
3—7-10 Ton Guy 85' Booms & 50 Ton 100'

PILE HAMMERS & EXTRACTORS

9—McKiernan-Terry No. 1, 3, 5, 6, 7, 9B3, 10B3
Vulcan 800 Extractor & Vulcan #2 & 1 Hammers

PUMPCRETE & GUNITES

Model 160, 190 & 180 & 200 REX Pumpcretes
2—GUNITE N1 Cement Guns & 2—N2

MISCELLANEOUS

1200 ft. 18-20-24 & 26 in. Conveyors
¾ yd. and 1 yd. Owen Clam Shells
2—Bucyrus & Owen Rock Grabs
6x30, 5x50 & 44x25 Cummer Rotary Dryers
1 yd., 2 yd. & 3 yd. Concrete Mixers

LOCOMOTIVES

6—4, 8 & 15 Ton PLYMOUTH Diesel 36 ga.
4—WHITCOMB 5 to 8 Ton 24 Ga. Gasoline
3—WHITCOMB 8 Ton & 14 Ton 36 Ga. Gasoline
2—PLYMOUTH 10 Ton & 20 Ton Std. Ga. Gas.
4—VULCAN 20, 40 & 80 Ton Steam Std. Ga.
7—Storage Battery 3 to 8 ton

DUMP CARS

136 TUNNEL CARS ½, 1 Yd., 2 Yd. & 4 Yd. Cap.
40—12 Yd., 20 Yd. & 30 Yd. Std. Ga. Air Dump

HOISTING ENGINES

STEAM: 14x12, 9x10, 8¼x10 & 7x10
ELECTRIC: 30, 40, 60, 80, 100, 125 & 150 H.P.
GAS & DIESEL: 15, 40, 75, 90, 110 & 140 H.P.

Want To Buy All Types Contrs. Equipt.

R. C. STANHOPE, INC.
Telephone: Murrayhill 2-3076
60 E. 42 St. NEW YORK, N. Y.

CRANES

2—LINK - BELT FULL REVOLVING, SELF-PROPELLING, BROAD GAUGE STEAM CRANES, COMPLETE WITH FIVE-YARD CLAMSHELL BUCKETS AND 100' BOOMS CONDITION EQUIVALENT TO NEW.

1—HEYL & PATTERSON FULL REVOLVING — 3/60/440 PORTAL TRAVELLING GANTRY CRANE. MAXIMUM CAPACITY 60-TONS AT 69'-0". PORTAL 18x25. GAUGE 30' HT. TO ROTATING BASE 59'. 5-TON AUXILIARY. MECHANICALLY FINE.

1—HEYL & PATTERSON FULL REVOLVING—250 V—D.C.—PORTAL TRAVELLING GANTRY CRANE. MAXIMUM CAPACITY 50-TONS AT 54'-0". PORTAL 18x23. GAUGE 28'. HT. TO ROTATING BASE 30'. 5-TON AUXILIARY. CONDITION EXCELLENT.

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Mgr. Equip. Division

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Widener Bldg., Philadelphia, Pa.
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READY FOR WORK

1—Factory Rebuilt **Syntron** Model 4, **Electric Internal Vibrator,** Serial #691V-24160. Equipped with 6' Casing and Core and #158 Vibrating Head 1⅝" Diameter.
1—Rebuilt **Koehring 27E2A Paver.** Serial #15632, equipped with 25' boom, 140 Auxiliary Water Tank, powered by Waukesha Model 6KU55 Gasoline Engine, Serial #198573.
1—New **Syntron** Model 1-158, **Electric Internal Vibrator,** Serial #1081V20590 Direct Current Motor, equipped with 7' Casing and Core and #158 Vibrating Head 1⅝" Diameter.
1—2 ton **Roper Electric Hoist** 220 A.C.—3 Phase.

D. C. ELPHINSTONE, INC.
BALTIMORE, MARYLAND

FOR SALE OR RENT

GRADER

1—CATERPILLAR Diesel Model 10 Auto Patrol Grader. Mounted on pneumatic tires. Diesel operated. Dual drive.

HAMMER

1—10B-3 McKIERNAN TERRY HAMMER, fitted with flat anvil block for sheet steel piling.

MIXERS

2—RANSOME 42-S CONCRETE MIXERS 1½ yd. capacity. Electric driven. Fitted with Batch Meters.

SHOVEL FRONTS

1—LITTLE GENERAL Shovel Front. ½ yd. capacity.
1—KOEHRING Model 301 Shovel Front. ¾ yd. capacity.
1—KOEHRING Model 401 Shovel Front. 1 yd. capacity.
1—NORTHWEST Model No. 5 Shovel Front. 1¼ yd. capacity.
1—BYERS SHOVEL FRONT. 1¼ yd. capacity.
1—KOEHRING Model 376 Shovel Front. 1 yd. capacity.

ATLANTIC EQUIPMENT CORPORATION
503 Broad Street Station Building Philadelphia, Penna.
Rittenhouse 8583

LOCOMOTIVES

1—7 ton Whitcomb 36" gauge gasoline locomotive, type MO, power gasoline engine.

4—7 ton Plymouth type 2, Model D L 24" gauge locomotives power gasoline engines.

3—7 ton Whitcomb type MO 24" gauge, power gasoline engines.

1—7 ton Plymouth 24" gauge type 2 Model HL power gasoline engine.

1—3½ ton Plymouth 24" gauge Model A L 105 gasoline power.

1—3 ton Whitcomb 24" gauge type U. T. gasoline power engine.

GET RID OF IDLE MAN-HOURS

WAGONS

2—Martin Special wagons, with two sets of 4 wooden wheels, steel rims and steel artillery hubs. Cap. 15 tons.

1—Wooden body, 2 door dump on 2 wheel trucks. Mfg. Little Red Wagon Co. Body dim. 40"x26"x6' 4".

4—La Plante Choate all steel 2 door bottom dump, wagons mtd. on 4 wheel trucks, capacity 19 tons.

2—La Plante Choate all steel 2 door bottom dump mounted on 4 wheel trucks. Cap. 8 tons.

2—La Plante all steel two door dump wagons, mounted on 4 wheel trucks. Dim. body 44" x 63" x 36".

Wake up the loafing man-hours that are lying around in your idle equipment. Sell the equipment to us. We will add some new man-hours in REBUILDING it and then put them all to work on a war job.

FOR SALE

PUMPCRETE—1—Rex Model 200 single pumpcrete, No. CP-144. Capacity 25 to 33 yards per hour. Powered with 6 cylinder 40 HP Waukesha gasolene engine. Pumpcrete complete.

ROAD ROLLERS

1—12 ton 3 wheel Buffalo Springfield, gas power with scarifier.
2—12 ton 3 wheel Huber gas power, with scarifier.
2—10 ton 3 wheel Acme, gas power, ser. #1234, #1062 with scarifier.
1—10 ton 3 wheel Monarch, steam power, ser. #1030.
1—5 ton 3 wheel Good Roads #A-5-2, gas power.
1—5 ton Iroquois steam #2160 tandem.
1—3 ton 3 wheel Austin pup gas power.

SHOVELS & CRANES

1—No. 1 Brown hoist, Ser. #10271 with 35' boom.
2—B-2 Erie steam cranes with 40' boom.
1—No. 2 Northwest shovel, ser. #2908, ½ yd. shovel front.
1—Mdl. 301 Koehring, ser. #544, with 45' boom.

SHOVEL & PULL SHOVEL ATTACHMENTS

11—**ATTACHMENTS**—1—2 yd. Link-Belt K 55, 1—1¼ yd. Link Belt K 42, 1—1 yd. Erie Gas Air GA-2, 1—1 yd. Osgood, 1—1 yd. Northwest 105, 1—¾ P & H 206. All above are shovel attachments, 2—1¼ yd. Link Belt K 42, 2—1 yd. Northwest #4. All the above are pull-shovel attachments.

TRACTORS

2—Allis Chalmers Mdl. K with Baker Bulldozers.
2—Fordson tractors with double drum winches, 4 wheel. One with steel wheels, other solid rubber tires.
1—Taylor tractor, mdl. A-16-30, mtd. on 4 steel wheels, with power take off, rated 52 H.P.
1—Linn tractor, mdl. 6-28-D, crawlers in rear and solid rubber tired wheels front. Power 100 H.P. engine. Equipped 5 yd. steel dump body.
1—Linn crawler tractor, 10 yd. cap. pneu. tires, in front, crawlers in rear.

PNEUMATIC TOOLS

Chipping hammers, Jack hammers, Paving breakers, Riveting hammers, Spades and Wagon Drills.

PAVERS

1—27 E Foote Paver, Serial #4083, power, 6 cylinder Hercules gasoline engine.
1—27 E Rex Paver, Serial # G 9568, 10% over-size drum, power, 6 cylinder Waukesha gasoline engine.
3—27 E Multiple Foote Paver, Serial #3534, #3861, and #3646. Two are powered with Hercules, and one with Continental gasoline engines.
2—27 E Ransome Pavers, Serial #9824 and #8368, with 10% oversize drum. Power, 50 HP Buda gasoline engines.
1—27 E Smith Tower Paver, Serial #48083, power, 6 cylinder Waukesha gasoline engine. Paver equipped with 60' Insley steel tower, with hopper and bucket.
3—27 E Koehring Pavers, Serial #12966, #13536, and #14390. Powered with 40 HP Waukesha gasoline engines.
2—27 E Foote Pavers, Serial #3923 and #4316. Powered with 50 HP gasoline engines.
1—27 E Ransome Paver, Serial #8705, powered with 50 HP Waukesha gasoline engine.
1—13 E Koehler Paver, Serial #13400, powered with 30 HP Waukesha gasoline engine.

PAVERS ARE ALL MOUNTED ON CRAWLERS, WITH POWER SKIPS, BOOMS, BUCKETS AND BATCHMETERS.

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Don't Delay — SPECIAL OFFER — *Immediate Shipment*

HEAVY DUTY RUBBER HOSE GUARANTEED

WATER HOSE
Each Length with Couplings Attached

I.D. Size		Length		Price per Length
¾"	—	25 feet	—	$4.50
	—	50 "	—	9.00
1"	—	25 "	—	6.25
	—	50 "	—	12.00
1¼"	—	25 "	—	7.50
	—	35 "	—	10.50
	—	40 "	—	12.00
	—	50 "	—	15.00
1½"	—	25 "	—	10.00
	—	35 "	—	14.00
	—	50 "	—	20.00

LARGER SIZES ALSO AVAILABLE

AIR HOSE

I.D. Size		Length		Per Length	Couplings
½"	—	25 feet	—	$5.00	—$1.50 Pair
	—	50 "	—	10.00	— 1.50 "
¾"	—	25 "	—	7.50	— 2.50 "
	—	50 "	—	15.00	— 2.50 "
1"	—	25 "	—	10.00	— 3.50 "
	—	50 "	—	20.00	— 3.50 "
1¼"— Price on Application					
1½"—		"	"	"	
2"—		"	"	"	

OTHER SIZES ALSO AVAILABLE

All Prices—Net—F.O.B. New York—Federal Excise Tax Included
ALL HOSE GUARANTEED

CARLYLE RUBBER CO., Inc.
64 PARK PLACE — NEW YORK, N. Y.

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Steel Guy Derricks, 7½ to 50 tons capacity
A.C. Electric Double Drum Hoists, 80 to 120 h.p.
Double Drum Steam Hoists
Stiff Leg Derricks
Compressors
Every kind of construction equipment

Attractively priced for quick sale or rent.

KARL KOCH
362 Casanova St., Bronx, N. Y.
Dayton 9-7474

For Sale—TRUCK MIXERS

2—4 cu. yard Jaeger Mixers mounted on AK Mack Trucks, 4 wheel brakes, power take-off.

HARRY C. LEWIS
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DIESEL ENGINES

Large selection—All sizes and types. Generator units, marine engines, gasoline engines, auxiliaries —also boilers, steam engines, turbo generators.

Complete information on request

A. G. SCHOONMAKER COMPANY
50 Church Street New York, N. Y.
Phone—Worth 2-0455-6-7

GEORGE HAISS MFG. CO., Inc. — HAISS — 140th St. & Rider Ave. New York

Send me full details and prices on equipment checked:

DIGGING BUCKETS

1 Owens, Type "M", ¼ Yard 2600#
1 Williams, Type "MF", 1¼ Yd. 4600#

REHANDLING BUCKETS

1 Hayward, Type "E", 1¼ Yd. 3200#

Name .....

Address .....

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STEEL TRUSSES

17—40'0" span, with 5" channel purlins, with or without concrete filled pipe columns 23'0" long,

10—30" Plate Girders, 20'0" long,

2—30" Plate Girders, 45'6" long,

Also large stock of used beams in good condition. Used Material. No priority necessary.

ROSS STRUCTURAL IRON WORKS, INC.
Richmond, Va.

FOR SALE

1—10 ton **hand operated overhead crane** with 45 ft. span
1—55 ft. **Boom** like new
1—**Buffalo Springfield** 10 ton 3 wheel **roller**
2—2½ yd. **Jaeger Mixers** mounted on International truck
1—3½ yd. **Blaw Knox Mixer** mounted on International truck
1—1942 **Jaeger** 4 yd. **truck mixer**, no truck
Several double and triple drum **Steam Hoists** in good condition.
1—Model 42-15 **Austin Trencher**
2—**Rex 78 Mixers** with Pneumatic tires
1—**Rex 58 Mixer**, completely rebuilt

Rupp Equipment Company
101 GREAT ARROW AVENUE,
BUFFALO, NEW YORK

RECONDITIONED
TRUCK MIXER FLEET

4—12-yard Steel Dump Bodies with Hoists

6—4-yard Jaeger Truck Mixers mounted on A.C. Mack Trucks.

2—3-yard Blaw-Knox Truck Mixers mounted on B.F. Mack Trucks.

4—2-yard Separate Engine Drive Jaeger Mixers, mounted on 1936 E.H. Mack Trucks.

1—2-yard Separate Engine Drive Jaeger Mixer, mounted on 1941 Ford V-8 Truck.

ALL THESE MACHINES NOW WORKING

Immediate Delivery

Will consider minimum 6-month rental

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Northern Blvd., at 127 St. Corona, L. I., N. Y.

Phone NEwtown 9-7777

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Approximately 400 Tons 42" Girders 225# per ft.—40' to 50'.
Also large stock of all sizes **Structural Shapes and Plates**

We specialize in Warehousing and Fabricating new and used Steel Products.

Send us your Inquiries.

LONG ISLAND BEAM CO.
39-21 21st Street
Long Island City, N. Y.

LOCOMOTIVE CRANES

1—#6 Brownhoist 8 wheel steam operated Locomotive Crane 30/40 Ton capacity, equipped with 70' boom; ASME boiler; being overhauled; four weeks delivery.
1—25 Ton Link Belt 8 wheel steam operated Locomotive Crane equipped with 60' boom; ASME boiler; now being rebuilt; eight weeks delivery.
1—25 Ton Browning #8C 8 wh. steam operated Loco. Crane equipped with 50' Boom Ind. swinging engine—immediate delivery.

LOCOMOTIVES

2—80 Ton American type 0-6-0 standard gauge Saddletank Locomotive.
1—50 Ton American type 0-4-0 standard gauge Saddletank Locomotive equipped with ASME boiler. NOW BEING REBUILT—10 week delivery.

LOCOMOTIVES (Continued)

1—74 Ton American 6 wheel Switcher with separate tender; cylinder sizes 20"x26"; READY FOR IMMEDIATE SERVICE AND DELIVERY.

CARS

33—50 Ton capacity Twin Hopper Coal Cars; mounted on cast steel side frame trucks; immediate delivery.

25—50 Ton capacity Twin Hopper Coal Cars mounted on arch bar trucks; immediate delivery.

24—40 Ton capacity Flat Cars 36' 10" long; all steel underframe; fish belly type center sill; steel end and side sills; cast steel side frame trucks; immediate delivery.

B.M.WEISS CO. GIRARD TRUST CO. BLDG. PHILADELPHIA
Telephone Rittenhouse 2311

25-ton **Browning Locomotive Crane**
40-ton **Browning Locomotive Crane**
20-ton **Brown Hoist Locomotive Crane**
Locomotives Standard and Narrow Gauge
Boilers for Locomotive Cranes
7½-ton Capacity **Austin Crawler Crane**
7½-ton Capacity **Orton Crawler Crane**
25 to 50-ton Capacity **Crawler Cranes**—Bucyrus-Erie, 52-B, 50-B.

"STONE THE CRANE MAN"
502 Insurance Exchange Bldg. Detroit, Mich.

FOR SALE

1—**Monighan Steam Dragline**, skid and roller, 100' boom, 3½-yd. bucket. Butt-strapped boiler. 10½"x12" main engine.

Malvern Gravel Company
MALVERN, ARKANSAS

DEPENDABLE USED MACHINES

Blaw Knox 30 yd. bin
Int. T40 with bulldozer
A-C 80 with angledozer
18x25 Kewanee conveyor
18x40 Wisconsin conveyor
Link Belt K-1 crane
Lorain ½ yd. crane
Carroll 24x36 crusher
Gruendler 10x20 crusher
Parsons 21 ditcher
Northwest 104 dragline
Haiss loader
D-13000 power unit
Huber 5 ton roller
4x12 vibrating screen
Lorain 75B shovel
Hyster truck crane
Lippman screw washer

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PITTSBURGH P. O. Box 5933, Dept. ENR | PHILADELPHIA 1500 Race St.

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SELL | RENT

4

SEARCHLIGHT SECTION

TRACTORS—BULLDOZERS
Cat. 60 Tractor—5 yd. Scraper
Allis Chalmers K Tractor, bulldozer

LOCOMOTIVES & CARS
Baldwin 80 ton Steam, std. ga.
Baldwin 65 ton, steam, std. ga.
American 60 ton, steam, std. ga.
Plymouth 16 ton, Diesel, 36" ga.
Vulcan 16 ton, gas, 36" gauge
Vulcan 8 ton, std. gauge, gas
Whitcomb 6 ton, 36" gauge, gas.
24—12 yard Air Control Dump Cars.
3—16 ton Flat Cars
4—10 ton, std. ga. Flat Cars
Track removal equipment

CONCRETE PLANTS—MIXERS
B.K. 325 bbl. Bulk Cement Plant
B.K. 50 ton Bin, 2 compts. with scales
Ransome 27E Dual Paver, Diesel
2—Koehring 27E Pavers.
Smith 27E Tower Paver.
2—Jaeger 4 yd. Mixers on Mack Trucks
Complete Ready-Mix Concrete Plant
Jaeger BP-2 Black Top Paver

PUMPS
Const. Mach. Co. 6" cent., gas.
Barnes 4" Duplex, gas, portable
American 4" Sump Pump, electric
Allis Chalmers 10" cent, electric.
Gorman Rupp 5" cent. gas
Dayton Dowd 6 x 8 cent., electric
8" Worthington cent., elec. 40 HP.
8" Gould's Duplex plunger, gas.
Dredge Pump 10", 200 HP motor
Lawrence cent. 6", 20 HP, elec.

SHOVELS & CRANES
P & H 7 ton Truck Crane, pneu.
Lorain Model 77 Diesel Shovel, 1½ yd.
Brownhoist 5 ton Crane, gas
Lorain Model 75B, 1½ yard Shovel, gas.
Lorain 75A, 1¼ yard Shovel, rebuilt
Osgood 1¼ yd. gas Shovel, rebuilt
Buc. Erie 50 Steam Shovel, 2 yds.
Buc. Erie Electric Tunnel Shovel, 1 yd.
Buc. Erie Gas-Air 1 yard Shovel
Buc. Erie Model 1035 ⅞ yard Shovel
Buc. Erie 1 yard Steam Shovel
Byers Model 100 Shovel, 1 yard
Ind. Brownhoist gas Crane, 40' bm.
Marion Model 480, 2 yard Steam Shovel
Marion Model 32, 1½ yd. Steam Shovel.
General Excavator Shovel, ⅝ yd.
McMyler 25 ton Steam Crane.
Industrial loco. crane, steam, 15 tons.
Industrial loco. crane, 20 tons.
Industrial loco. crane, 15 tons, gas.
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1—1½ yd. Williams Clam. rehandling
1—¾ yd. Williams Clam. rehandling
1—1½ yd. Hayward Clam. rehandling
1—1 yd. Hayward clamshell digging.
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Erie ¾ yd. Clamshell rehandling.
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20—Battleship Buckets, 2½-3 yds.
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B. S. 10 ton, 3 wheel, gas
B. S. 10 ton, 3 wheel, steam
Huber 5 ton, 3 wheel, gas

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Whirley, 20 ton Steam Crane, 100' boom, Hull 33' x 114' x 10'. Splendid.

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Lambert electric swinger 40 HP
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American D.D. 60 HP. gas
Lambert D.D. steam, 50 HP boiler
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Stiff-leg Derrick 10 tons, 100' bm. with elec. hoist.
Stiff-leg Derrick, 10 tons, 70' bm.

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Gard. Denver 790 cu. ft., 2 stage, Elec.
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100,000 gal. on 100' Tower
75,000 gal. on 85' Tower
40,000 gal. on 100' Tower
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12,000 gal. Asphalt Storage 10x38'

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Pile Driving Outfit, Bucyrus Erie 50B
Steam Crane with 75' leads & No. 1 Vulcan Pile Hammer.

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SUITABLE FOR COAL OR ORE
GANTRY TYPE • CAPACITY 750 T.P.H.
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FROGS—SWITCHES—CROSSINGS
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ELECTRIC SHOVEL

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Width	Ply	Top-Bottom	Covers
48"	5	1/8"	1/16"
42"	5	1/8"	1/16"
36"	6	1/8"	1/16"
30"	6	1/8"	1/16"
30"	5	1/8"	1/16"
24"	5	1/8"	1/32"
24"	4	1/8"	1/32"
20"	5	1/8"	1/32"
20"	4	1/8"	1/32"
18"	4	1/8"	1/32"
16"	4	1/8"	1/32"
14"	4	1/16"	1/32"
12"	4	1/16"	1/32"

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HEAVY-DUTY FRICTION SURFACE

Width	Ply	Width	Ply	Width	Ply
18"	6	10"	6	6"	5
16"	6	10"	5	5"	5
14"	6	8"	6	4"	5
12"	6	8"	5	4"	4
12"	5	6"	6	3"	4

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Width	Ply	Top-Bottom	Covers
12"	6	1/16"	1/16"
14"	6	1/16"	1/16"
16"	6	1/16"	1/16"
18"	6	1/16"	1/16"

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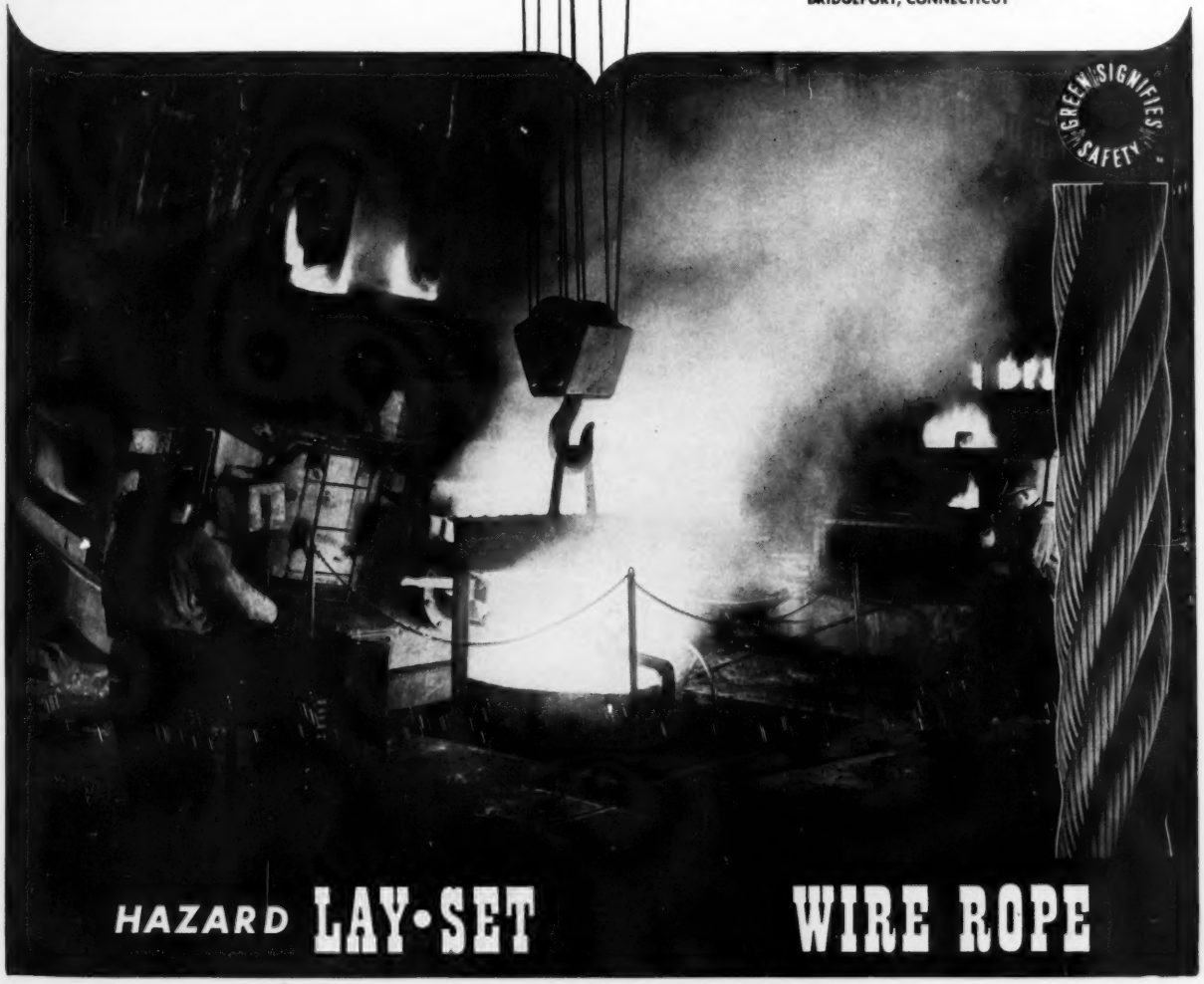

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Timken Bearing Equipped Letourneau Model RU Carryall Scraper and "Caterpillar" Diesel Tractors working on U. S. Highway 101 along the California coast. The scraper is shown being pusher-loaded to 30 heaped yards.

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